Energy Assessment
Wellington Road

+44 (0)20 7043 0418
info@eightversa.com

Document information

Document prepared for
Kendall Kingscott Ltd

Date of issue
17/06/2025

Issue no.
1

Our reference
11260-Wellington Road-Energy Assessment-2021-2506-05rksar.docx

Document prepared by
Rakesh Shivaram

Quality assured by
Agathe Revil

Disclaimer
This report is made on behalf of Eight Versa Ltd. By receiving the report and acting on it, the client - or any third party relying on it - accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).

Contents:

Document information 1
Executive summary 2
Establishing Carbon Emissions 5
Demand Reduction 6
Cooling and Overheating 8
Heating Infrastructure 10
Renewable Energy 11
Conclusion 20
Appendix A 21

Energy Assessment
Wellington Road

eight versa

+44 (0)20 7043 0418
info@eightversa.com

Executive summary

About the Scheme
A full planning application to provide 21no. Class C3 units, including related ancillary functions, amenity space, landscaping, car and cycle parking and refuse storage. The development is located in the Wokingham borough council with a total GIA of approx. 1,207 sqm.

Planning policy
The policy relating to renewable energy and decentralised energy networks is set out in Policy CC05 of the Wokingham Borough Council Managing Development Delivery Local Plan (adopted 2014), and in Policy NRM11 of the Sustainable Design and Construction Supplementary Planning Document (May 2010). Both policies promote best practice in energy efficiency and sustainable construction, with a specific requirement for new developments to secure at least 10% of their energy from decentralised, renewable or low-carbon technologies.
According to the planning policies, the scheme should achieve:

- A minimum on-site CO_2 reduction of at least 19% beyond Building Regulations as best practice
- At least 10% CO_2 improvement through renewable technologies, 'Be Green' stage

Summary
The entire scheme has been modelled for the purpose of the energy assessment.

The scheme complies with the 2021 Building Regulations Part L and the minimum energy efficiency targets in the following documents have been followed:

- New build CO_2 emissions – The actual CO_2 Dwelling Emissions Rate (DER) is no greater than the notional building CO_2 Target Emissions Rate (TER).
- New dwelling Fabric efficiency – The Dwelling Fabric Energy Efficiency (DFEE) is not greater than the Target Fabric Energy Efficiency (TFEE).
- New build Primary energy – The Dwelling Primary Energy Rate (DPER) is no greater than the Target Primary Energy Rate (TPER).

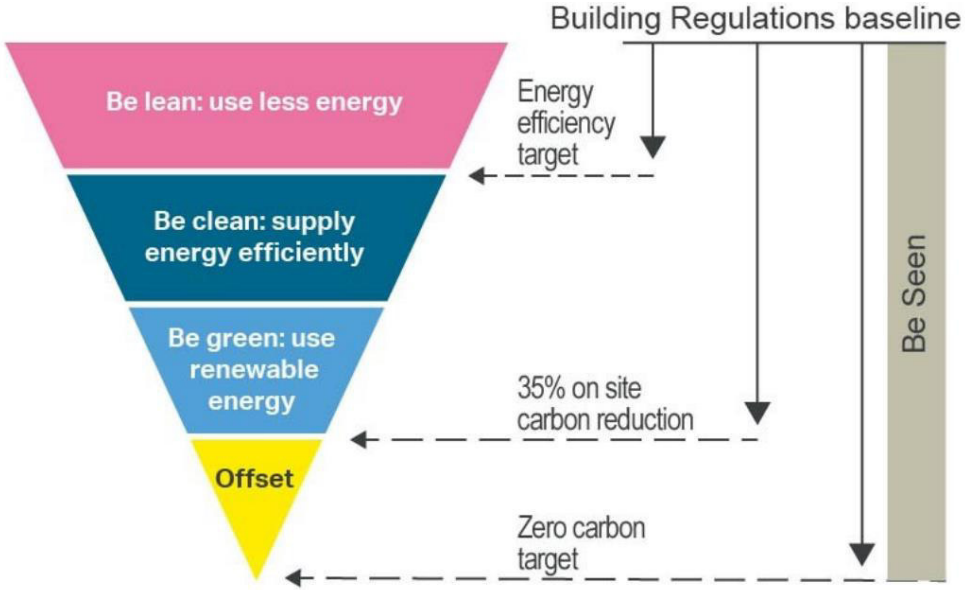
In addition, the CO_2 emissions of the scheme have been calculated using the SAP 10.2 carbon emission factors, and the scheme can achieve:

- An on-site CO_2 reduction of 85% beyond Building Regulations through energy efficiency measures and inclusion of renewable technologies (Air Source Heat Pumps and PV panels)
- An on-site CO_2 reduction of 21% through energy efficiency measures, 'Be Lean' stage
- A further reduction in CO_2 of 64% through renewable technologies at the 'Be Green' stage (Air Source Heat Pumps and PV panels)
- An improvement of 1.15% in Fabric Energy Efficiency
- An improvement of 73.7% in Primary Energy Rate

Energy Assessment
Wellington Road

+44 (0)20 7043 0418
info@eightversa.com

Energy hierarchy
The proposed scheme has followed the energy hierarchy that is illustrated below:



Source: Greater London Authority

Key measures
Key measures identified for each stage are shown below:

- Be Lean:
  - Low U-values for opaque elements and fenestration
  - Low g-value
  - Low air permeability
  - High efficiency lighting
  - Mechanical ventilation with heat recovery
- Be Clean:
  - No measures specified at this stage
- Be Green:
  - Air Source Heat Pumps to provide space heating and hot water
  - Photovoltaic panels

Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Energy Hierarchy: Regulated carbon emissions

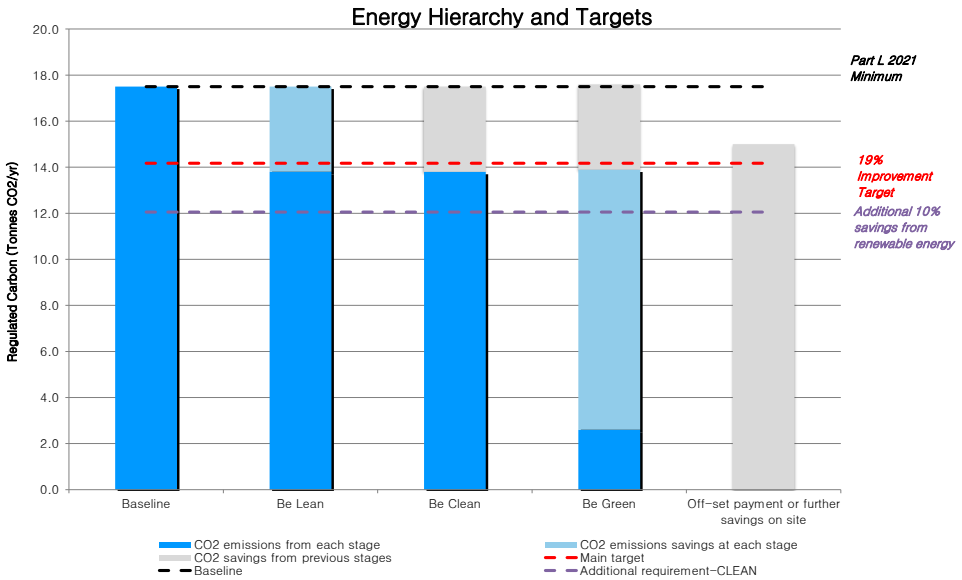
The proposed scheme has followed the energy hierarchy. A graphical illustration of how the scheme performs in relation to Building Regulations and the Energy Hierarchy is shown below. Carbon dioxide emission factors for SAP 10.2 have been used for the calculation.

As demonstrated in the figure the proposed scheme will reduce carbon emissions by 21% from the fabric energy efficiency measures described in the 'Be Lean' section and will reduce total carbon emissions by 85% over Building Regulations (using SAP 10.2 carbon dioxide emission factors) with the further inclusion of low and zero carbon technology (Air source heat pumps and photovoltaic panels).

Therefore, the scheme meets and exceeds the best practice carbon reduction target and complies with Policy NRM11 of the Sustainable Design and Construction Supplementary Planning Document (May 2010) and Part L 2021.

Regulated CO_2 emissions

Site-wide				
Energy Hierarchy: Regulated CO_2 - Calculated using SAP 10.2 CO_2 factors				
	Baseline:	Be lean:	Be clean:	Be green:
CO_2 emissions (tCO_2/yr)	17.5	13.8	-	2.6
CO_2 emissions saving (tCO_2/yr)	-	3.7	-	11.3
Saving from each stage (%)	-	21	-	64
Total CO_2 emissions saving (tCO_2/yr)	15.0			
85% total CO2 savings over 2021 Building Regulations Part L achieved				



Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Establishing Carbon Emissions

Methodology

The purpose of an energy assessment is to demonstrate that climate change mitigation measures comply with Wokingham borough energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the scheme's design and evolution.

The methodology followed in this report follows the guidance set out by the Greater London Authority (GLA) as best practise guidance.

This report has followed these documents and comprises the following components:

- Baseline: A calculation of the Part L 2021 Building Regulations compliant CO_2 emission baseline using approved software. The baseline assumes a gas boiler would provide heating and any active cooling would be electrically powered Photovoltaic panels are included in the baseline in line with Part L 2021.
- Be Lean: A calculation of the impact of demand reduction measures. For example, passive design measures, including optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading, and active design measures such as high efficacy lighting and efficient mechanical ventilation with heat recovery.
- Cooling Hierarchy: Measures that are proposed to reduce the demand for cooling have been set out such as minimisation of solar and internal gains and night cooling strategies.
- Be Clean: This report has demonstrated how the scheme has selected heating, cooling and power systems to minimise carbon emissions. This comprises an evaluation of the feasibility of connecting to existing low carbon heat networks, planned networks, site-wide and communal heat networks, and CHP.
- Be Green: This report has conducted a feasibility assessment of renewable energy technologies. This comprised a site-specific analysis of the technologies and, if applicable, how they would be integrated into the heating and cooling strategy for the scheme.

Establishing CO2 emissions

The regulated and unregulated emissions of the development must be quantified and demonstrated. The total emissions for the scheme are shown below.

CO_2 Emissions – Regulated and Unregulated (tonnes CO_2/yr) - SAP 10.2			
	Regulated Emissions	Unregulated Emissions	Total Emissions
Baseline: Part L 2021	17.5	12.7	30.2
Be Lean: Use less energy	13.8	12.7	26.5
Be Clean: Supply energy efficiently	-	-	-
Be Green: Use renewable energy	2.6	12.7	15.3

Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Demand Reduction

Be Lean: summary
Demand reduction measures have reduced the scheme's carbon emissions by 21% (using SAP 10.2 figures) over the minimum Part L 2021 Building Regulations baseline

U-values

Element	Minimum 2021 Building Regulations U-value W/m^{2}K	Proposed U-value W/m^{2}K
Flat roof	0.16	0.10
Pitched roof	0.16	0.10
Wall	0.26	0.12
Ground floor	0.18	0.09
Windows	1.60	0.90 (g-value 0.30)
Doors	1.60	0.90

Party walls will be fully filled cavity with effective sealing at all exposed edges and in line with insulation layers in abutting elements.

Air permeability
A reduced air permeability has been targeted as per the table below:

Air permeability (m^3/hm^2 @50 Pa)	Minimum 2021 Building Regulations	Proposed
Domestic	8	3

This will require careful attention to two key areas:

- Structural leakage
- Services leakage

Structural leakage occurs at joints in the building fabric and around window and door openings, loft hatches and access openings. There will also be some diffusion through materials such and cracks in masonry walls typically caused by poor perpends in the blockwork or brickwork. Structural leakage is hard to remedy retrospectively therefore good detailing at the design stage is essential.

Services leakage occurs at penetrations from pipes and cables entering the building. These can be sewerage pipes, water pipes and heating pipes. As well as electricity cables there may also be telecommunication cables. Attention, therefore, needs to be paid to sealing all penetrations during construction.

Thermal Bridging:
The scheme will be designed in line with best practise guidance and will target to reduce heat losses through thermal bridging. A detailed thermal bridging analysis will be required at the technical design stage to ensure that the following psi-values can be achieved.

Junctions	Psi-value (W/mK)
Lintels (E2)	0.20
Sill (E3)	0.04
Jambs (E4)	0.05
Ground floor (E5)	0.13
Flat roof (E14)	0.08
Flat roof with parapet(E15)	0.08
Party Floor between dwellings (in blocks of flats) (E7)	0.07
Corners (E16)	0.09
Corner – inverted (E17)	-0.09
Party Wall between dwellings (E18)	0.06
Staggered Party wall between dwellings (E25)	0.08
Eves (Insulation at ceiling level inverted) (E24)	0.24
Party wall – Ground floor (P1)	0.22

The default psi-value has been used for the remaining junctions.

Thermal Mass:
Thermal mass of the scheme has been indicatively modelled as 250 kJ/m^{2}K (medium).

Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Heating
For the 'Be Lean' scenario, the scheme has been modelled with a gas boiler with an efficiency of 89.5%. For the 'Be Green' final scenario, an air source heat pump system with a minimum COP of 3 will be proposed as the main heating system (Mitsubishi Electric, Ecodan 8.5kW, PUHZ-WM85YAA or similar). Heat will be provided via radiators and will be controlled via time and temperature zone control by arrangement.

Communal corridors will be unheated.

Hot Water
For the 'Be Lean', the hot water will be provided by the main gas heating system (gas boiler with an efficiency of 89.5%). For the 'Be Green' final scenario, hot water will be provided by the air source heat pump (Mitsubishi Electric, Ecodan 8.5kW, PUHZ-WM85YAA or similar). A 150L hot water cylinder will be specified with a heat loss factor of 2.09 kWh/day.

Ventilation
Mechanical ventilation with heat recovery (Vent Axia Kinetic Plus E or similar) has been specified for all 21 flats. All flats with have been modelled with a SFP of 0.43 and a heat recovery efficiency of 94%.

Cooling
No cooling has been specified for the flats.

Lighting
High efficiency lighting has been specified for the development with a minimum efficacy of 80 lumens/W and a power of 10W. The following average number of fittings has been assumed for the houses:

House	No. of fittings
All Flats	15

Fabric energy efficiency

	Target Fabric Energy Efficiency (MWh/year)	Design Fabric Energy Efficiency (MWh/year)	Improvement (%)
Scheme	46.59	46.04	1.15%

Primary Energy

	Target Primary Energy Rate (MWh/year)	Dwelling Primary Energy Rate (MWh/year)	Improvement (%)
Scheme	92.77	24.39	73.7%

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Cooling and Overheating

Overheating and cooling

The aim of this section is to reduce the impact of the urban heat island effect in cities and encourage the design of spaces to avoid overheating and excessive heat generation, and to mitigate overheating due to the impact of climate change.

Where design measures and the use of natural and/or mechanical ventilation are not enough to guarantee the occupant's comfort, in line with the cooling hierarchy the development's cooling strategy must include details of the active cooling plant being proposed, including efficiencies, and the ability to take advantage of free cooling and/or renewable cooling sources.

Where appropriate, the cooling strategy should investigate the opportunities to improve cooling efficiencies through the use of locally available sources such as ground cooling and river/dock water-cooling.

The Cooling Hierarchy

Developments should reduce potential overheating and reliance on air conditioning systems and demonstrate this with the Cooling Hierarchy:

1. Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure
2. Minimise internal heat generation through energy efficient design
3. Manage the heat within the building through exposed internal thermal mass and high ceilings
4. Provide passive ventilation
5. Provide mechanical ventilation
6. Provide active cooling systems

Avoiding overheating: measures taken

The following measures have been taken in accordance with the cooling hierarchy to reduce overheating and the need for cooling:

1. Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure
    - Orientation of building – the scheme has been orientated East/West to reduce excessive solar gain and openable windows have been specified to facilitate natural ventilation.
    - Solar control – all methods controlling solar gain to within tolerable limits have been considered. The location, size, design and type of window openings and glazing have been optimised and reduced solar gain factors from low emissivity windows have been specified.
    - Solar shading devices such as overhangs have been specified to limit solar gain. The shading has also been optimised to avoid substantially reducing daylighting or increasing the requirement for electric lighting.
    - Insulation levels have been maximised and the resulting U-values are lower than required by Building Regulations. The build-ups therefore prevent the penetration of heat as much as practically possible. See the 'Be Lean' section of this report for target U-values.
    - A reduced air permeability rate has been targeted to minimise uncontrolled air infiltration. This will require attention to detailing and sealing. See 'Be Lean' section of this report for details of how this will be achieved.

eight versa
+44 (0)20 7043 0418
info@eightversa.com

2. Minimise internal heat generation through energy efficient design
    - Internal heat gains have been minimised where possible. Energy efficient appliances will help reduce internal heat gain and reduce the cooling requirement.
    - Energy efficient lighting will also be specified as per the 'Be Lean' section.
    - Heat distribution infrastructure within building will be designed to minimise pipe lengths, particularly lateral pipework in corridors of the apartment block. Twin pipes configuration will be adopted to minimise heat loss.

3. Manage the heat within the building through exposed internal thermal mass and high ceilings
    - High thermal mass – exposed building fabric materials such as masonry or concrete have been utilised in the form of concrete floors and dense masonry external walls. These materials act as 'thermal batteries'; they absorb heat gains during the day when the building is occupied and 'store' it for an extended period, thereby helping to stabilise daytime temperatures. At night this heat can be dissipated, which 'resets' the heating cycle. Ventilation will also be used at night to purge the stored heat within the structure. A 'ground coupled' system that uses the thermal storage capacity of the ground has not been specified as the passive ventilation option has been selected instead.
    - Room heights – high ceilings are traditionally used in hot climates to allow thermal stratification so that occupants can inhabit the lower cooler space, and to decrease the transfer of heat gain through the roof. The proposed building has floor to ceiling heights of more than 2.5m. As the roof will be well insulated to below building regulations, there will be minimal penetration of heat through the roof.

4. Provide passive ventilation
    - Openable windows are specified on all facades of the building.
    - Dual aspect units have been specified where possible, to allow for cross ventilation. Cross ventilation will be achieved by opening windows on two facades and ensuring there is a clear path for airflow.
    - Night time cooling will also be utilised. This will work in tandem with high thermal mass materials specified. The larger temperature differential that exists between internal and external temperatures at night will allow effective stack ventilation and purging of heat accumulated within the structure during the day.

5. Provide mechanical ventilation
    - Mechanical ventilation with summer by-pass will be used for each flat to make use of 'free cooling' where the outside air temperature is below that in the building during summer months.
    - A mixed mode system will be implemented. This will be complimentary to the passive cooling measures taken. During summer months, mechanical ventilation using fans will remove hot air from the building.
    - The mechanical systems will comply with the Domestic Building Services Compliance Guide as it is demonstrated in the 'Be Lean' section.

Overheating risk

The overheating risk considering all the above-described passive measures have been assessed for the scheme. A dynamic overheating analysis carried out by Eight Versa '11260-WellingtonRoad-Overheating-Part O-2506-09spar', issued in June 2025, confirms that the scheme meets the CIBSE TM52 and TM59 requirements and comply with the new Part O. Overheating Mitigation.

Active cooling

Air conditioning has not been specified for the scheme, since the overheating analysis demonstrates the there is no significant risk of overheating and the passive design measured are enough to guarantee the occupant's comfort.

eight versa

+44 (0)20 7043 0418
info@eightversa.com

Heating Infrastructure

Heating infrastructure including CHP

Once demand for energy has been minimised, schemes must demonstrate how their energy systems have been selected. This has involved a systematic appraisal of the potential to connect to existing or planned heating networks and on site communal and CHP systems.

Developments in Heat Network Priority Areas (HNPAs) should usually have a communal low-temperature heating system and should select a heat source in accordance with the following heating hierarchy:

- connect to local existing or planned heat networks
- use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
- use low-emission combined heat and power (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
- use ultra-low NOx gas boilers

Connect to local existing or planned heat network

No existing or planned network was found to be present within connectable range of the scheme. Therefore, a connection at this time is not possible.

Use zero-emission and/or local secondary heat sources

The exploitation of local energy opportunities to maximise the use of locally available energy sources whilst minimising primary energy demand and carbon emissions is encouraged. Secondary heat includes environmental sources such as air, water and ground; and waste sources such as heat from the sewerage system, sewage treatment plants, the tube network, data centres and chiller systems.

There are no local available waste heat sources for the scheme.

Use low-emission combined heat and power (CHP)

Where connection to an area wide heat network will not be available in the foreseeable future i.e. 5 years following completion, or the development is of such a scale that it could be the catalyst for an area wide heat network, applicants should evaluate the feasibility of on-site CHP.

Due to the grid decarbonisation, CHP will result in higher carbon emissions compared to an ASHP, and therefore this option has been rejected.

Use ultra-low NOx gas boilers

Where it is clearly demonstrated that the above heating options (District heating, local secondary heat source and CHP) have been fully investigated and ruled out, then a site-wide heating strategy led by ultra-low NOx gas boilers can be considered.

Where it is demonstrable that a site wide network is not feasible then an individual heating strategy can be implemented. A site wide network will not be adopted because the development will not have adequate density and local conditions are not favourable to centralised distribution. Therefore, it is considered that distribution losses would be relatively large and the effectiveness and carbon reducing potential would be undermined when compared to an individual servicing strategy.

eight versa

+44 (0)20 7043 0418
info@eightversa.com

Renewable Energy

Renewable Energy Feasibility:
The feasibility of renewable energy technologies has been considered. A detailed site-specific analysis and associated carbon saving calculations has also been provided for renewable energy technologies considered feasible.

Each technology has been assessed under 3 broader categories. There are key criteria for each category on which the technology is evaluated. The key criteria have been given a weighting based on a tick-system, a graphical representation of this is shown below:

The weighting of each of the criteria within the categories is shown below:

- Local, site-specific impact: (Maximum score of 5)
  - Local planning criteria = ✓
  - Land used by all components = ✓
  - Noise impact from operation = ✓
  - Interaction on the current building design = ✓
  - Buildability of installation = ✓

- Economic viability: (Maximum score of 5)
  - Capital cost of all components = ✓
  - Grants and funding available = ✓
  - Payback periods (years) 3-5, 5-10, 10-15 = ✓
  - Servicing requirements (low or high) = ✓
  - Maintenance costs (low or high) = ✓

- CO_2 and sustainability: (Maximum score of 10)
  - Carbon saving per year = ✓✓✓✓
  - Impact of future grid decarbonisation (gas vs. electric) = ✓✓
  - Local air quality/pollution = ✓✓
  - Resource use of installation = ✓✓

Key comments on each of the criteria and the corresponding score will be provided in a table for each of the technologies. The score for each of the criteria will be summed and each of the technologies will then be ranked. The assessment of each technology is undertaken on the following pages.

eight versa

+44 (0)20 7043 0418
info@eightversa.com

Biomass & Biofuel - Rejected

Biomass is normally considered a carbon 'neutral' fuel, as the carbon dioxide emitted on burning has been recently absorbed from the atmosphere by photosynthesis. Although some form of fossil fuel derived inputs are required in the production and transportation of the fuel.

Wood is seen as a by-product of other industries and the small quantity of energy for drying, sawing, pelleting and delivery are typically discounted. Biomass from coppicing is likely to have external energy inputs from fertiliser, cutting, drying etc. and these may need to be considered. In this toolkit, all biomass fuels are considered to have zero net carbon emissions.

Biomass can be burnt directly to provide heat in buildings. Wood from forests, urban tree pruning, farmed coppices or farm and factory waste, is the most common fuel and is used commercially in the form of wood chips or pellets. Biomass boilers can also be designed to burn smokeless to comply with the Clean Air Acts.

Boilers can be fed automatically by screw drives from fuel hoppers. This typically involves daily addition of bagged fuels.

A biomass boiler could be installed on site for supplementary LTHW heating; however, a major factor influencing the suitability of a biomass boiler is the availability of the biomass fuel. A local and reliable fuel source would be essential for the biomass boiler to be an efficient replacement for a conventional boiler system. Therefore, a very comprehensive feasibility assessment needs to be undertaken to understand the practicalities of such a system.

It is estimated that the heating and hot water demand of the site is too large to meet the required CO_2 emissions reduction if a biomass boiler was a standalone system. Therefore, a biomass boiler would need to be combined with energy demand reduction measures and/or CHP. The likely installed cost would be circa £50,000. The additional cost of providing and storing the bio-fuel also needs to be accounted for. The site is likely to be unsuitable for biomass boilers due to site constraints such as limited transport/access issues, and storage of the biomass fuel.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO_2 and sustainability (out of 10)
✓	✓✓✓	✓✓✓✓✓
Local air quality impacts, increased transport usage, increased plant space, slightly increased buildability issues.	Increased capital costs of installation, typical payback of 8 years, Increased maintenance relative to gas boiler, resource use not significantly increased if well serviced.	Very low carbon intensity of feedstock if properly procured. Decarbonisation impact not applicable, air quality issues.

Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Photovoltaic Panels (PV) - Accepted

Photovoltaic systems convert energy from the sun into electricity through semi-conductor cells. Systems consist of semi-conductor cells connected together and mounted into modules. Modules are connected to an inverter to turn the direct current (DC) output into alternating current (AC) electricity for use in buildings.

Photovoltaic panels supply electricity to the building and are attached to electricity gird or to any other electrical load. Excess electricity can be sold to the National Grid when the generated power exceeds the local need. PV systems require only daylight, not sunlight to generate electricity (although more electricity is produced with more sunlight), so energy can still be produced in overcast or cloudy conditions.

The cost of PV cells is heavily dependent on the size of the array. There are significant cost reductions available for larger installations.

The most suitable location for mounting photovoltaic panels is on roofs as they usually have the greatest exposure to the sun. The proposed site has a potential useable roof area of approximately 350 m^2 oriented south.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO_2 and sustainability (out of 10)
✓✓✓✓ No local air quality impacts, use of unutilised roof space, no noise issues, good orientation, and slightly increased buildability issues for wiring and metering.	✓✓ Increased capital costs of installation, typical payback of 10-15 years, Feed in Tariff available, limited servicing and maintenance i.e. 1 visit per year, inverter will require replacement.	✓✓✓✓✓ ✓✓✓ High carbon saving from electricity, uses minimal grid electricity, no local air impact, high embodied energy of panels.

Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Solar Thermal – Rejected

Solar water heating systems use the energy from the sun to heat water for domestic hot water needs. The systems use a heat collector, generally mounted on the roof in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate hot water cylinder or a twin coil hot water cylinder inside the building. The systems work very successfully in all parts of the UK, as they can work in diffuse light conditions.

Like photovoltaic panels the most suitable location for mounting solar hot water panels is on roofs as they usually have the greatest exposure to the sun. The proposed site has a potential useable roof area of approximately 350 m^2 and is orientated south. However, the scheme has used this area for solar PVs as they can provide higher CO_2 savings compared to solar thermal panels.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO_2 and sustainability (out of 10)
✓✓✓✓	✓✓✓	✓✓✓✓✓
No local air quality impacts, use of unutilised roof space, no noise issues, good orientation, slightly increased buildability issues for piping and cylinders.	Increased capital costs of installation, typical payback of 8-10 years, Heat Incentive available, limited servicing and maintenance i.e. 1 visit per year, heat transfer fluid requires replacing every 10 years.	✓ Lower carbon saving as primarily displacing gas, uses minimal grid electricity, no local air impact, medium embodied energy of panels.

eight versa

+44 (0)20 7043 0418
info@eightversa.com

Wind Energy – Rejected

Wind energy is a cost-effective method of renewable power generation. Wind turbines can produce electricity without carbon dioxide emissions in ranges from watts to megawatt outputs. The most common design is for three blades mounted on a horizontal axis, which is free to rotate into the wind on a tall tower.

The blades drive a generator either directly or via a gearbox to produce electricity. The electricity can either be linked to the grid or charge batteries. An inverter is required to convert the electricity from direct current (DC) to alternating current (AC) for feeding into the grid.

Modern quiet wind turbines are becoming viable in low density areas where ease of maintenance and immediate connection to the grid or direct use of the electricity in a building, may make them cost effective, despite lower wind speeds than open areas.

Wind turbines are generally less suited to dense urban areas as their output will be affected by potentially lower and more disrupted wind speeds, and their use of much more cost-effective machines may be prohibited by their proximity to some building types. Small turbines can be used in inner city areas mounted on buildings, although there are relatively few installations.

A detailed wind resource evaluation would be required for the site to fully understand the generation potential and payback period. Also, it is likely that planning restrictions and resistance from groups within the local community could also affect the viability of wind energy for the project.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO_2 and sustainability (out of 10)
✓	✓✓✓✓	✓✓✓✓✓
No local air quality impacts, use of unutilised roof space, medium noise issues, relatively limited wind speeds in local area, increased buildability issues for wiring and metering.	Medium capital costs of installation, typical payback of 5 years, Feed in Tariff available, limited servicing and maintenance, costs of 2-3% typical.	High carbon saving from electricity, output limited from urban installation, consumes little grid electricity, no local air impact, low embodied energy of panels

eight versa

+44 (0)20 7043 0418
info@eightversa.com

Ground Source Heat Pump (GSHP) – Rejected

Geo-thermal energy is essentially heat collected from the ground. Heat obtained from the ground may be considered it as a source of heating and cooling within the UK by the use of a geo-thermal heat pump or ground source heat pumps.

A ground source heat pump is a device for converting energy in the form of low-level heat to heat at a usable temperature. The heat pump consists of five main parts: ground collector loop/or boreholes, heat exchanger, compressor, condenser heat exchanger and expansion valve.

At approximately 1.2-1.5 metres down below ground level the temperature is a constant 10 to 12°C. Any boreholes would need to be sunk to an effective depth of 50 – 120m and a ground feasibility report would be required to ascertain if this method of heat source were viable.

From the boreholes pre-insulated pipework is laid in the ground to the heat exchanger device. The system is filled with water and antifreeze. The cooled water is pumped around the loop / borehole gathering energy as it circulates. The water that has been heated to 10-12°C is returned to the ground source heat exchanger where the energy is transferred to the refrigerant gas. For every 1kW of energy used to compress the refrigerant, the process 'gives up' 4 kW of energy for use in the system being used to heat the building.

The installation cost for a Ground Source Heat pump is typically high compared to a gas-boiler installation.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO_2 and sustainability (out of 10)
✓✓ No local air quality impacts, no visual impact, no noise issues, however the constrained site may prohibit its installation. Increased buildability issues for pipework and heating emitters internally.	✓ High capital costs of installation, typical payback >15 years where gas is displaced, Renewable Heat Incentive available, limited servicing and maintenance i.e. 1 visit per year, mechanical parts may require replacement over lifespan.	✓✓✓✓✓ ✓✓✓ Medium carbon saving from gas displacement, consumes some electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.

eight versa

+44 (0)20 7043 0418
info@eightversa.com

Air Source Heat Pump (ASHP) –Accepted

Air source heat pump systems work on the same principle as a ground source heat pump although they use the outside air as the heat source.

The coefficients of performance given by air source heat pump systems are inferior to that of ground source systems due to varying air temperatures. In the depth of winter, the energy efficiency of an air source system will be lower than that of a ground source system, and it is likely that more back-up heat will be required if an air source unit is fitted. This back-up heat often comes from a direct electric heater. They operate over a varying temperatures range of -15°C to +25°C, however, the performance will reduce to below the required 3 to 1 carbon saving ratio in winter, and they also require a defrosting mechanism to melt ice that forms on the air heat exchanger.

ASHPs are cheaper to install than ground source heat pumps but carbon dioxide emission savings will typically be less than that of a ground source heat pump.

Air source heat pumps would provide a suitable HVAC solution for residential spaces which have relatively high heating and hot water demands. Having a system which is able to both, heat space and water provides versatility and reduces the amount of installed plant.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO_2 and sustainability (out of 10)
✓✓✓✓ No local air quality impacts, use of unutilised roof space, over visual impact, low noise issues, increased buildability issues for pipework and heating emitters internally.	✓✓ Medium- high capital costs of installation, typical payback >15 years where gas is displaced, Renewable Heat Incentive available Limited servicing and maintenance i.e. 1 visit per year, mechanical parts may require replacement over lifespan.	✓✓✓✓✓ ✓✓ Medium carbon saving from gas displacement, less efficient in winter, consumes electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.

Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Summary comparison matrix
An assessment of the feasibility of each of the technologies is shown below.

Renewable Technology	Comments	Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO_2 and sustainability (out of 10)	Total Score
Biomass Boiler	High air quality impact	✓	✓✓✓	✓✓✓✓✓	9
Photovoltaic	High CO_2 savings and low visual impact	✓✓✓✓	✓✓	✓✓✓✓✓ ✓✓✓	14
Solar Thermal	Low CO_2 savings compared to PV panels	✓✓✓✓	✓✓✓	✓✓✓✓✓ ✓	13
Wind Energy	High visual and noise impact	✓	✓✓✓✓	✓✓✓✓✓	10
GSHP	High capital cost	✓✓	✓	✓✓✓✓✓ ✓✓✓	11
ASHP	Low capital cost but low CO_2 savings compared to GSHP	✓✓✓✓	✓✓	✓✓✓✓✓✓ ✓	13

Photovoltaic panels, solar thermal panels and ASHPs have scored the best.

Due to the limited well oriented roof space, photovoltaic panels and ASHPs have been specified as they can provide higher CO_2 savings compared to the solar thermal panels.

Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Air Source Het Pump (ASHP) - Performance

An Air Source Heat Pump with a minimum COP of 3 (Mitsubishi Electric, Ecodan,8.5kW-PUHZ-WM85YAA or similar) will cover 100% of the space heating and hot water demand.

Photovoltaic panels (PV) - Performance

A photovoltaic panel system of 2.97kWp (9 panels of 330W each) has been specified for each flat for a total system of 62.37kWp PV panels will be placed with 45° tilt, oriented southeast and southwest as illustrated below, covering approx. 160m^2 of the roof.



Energy Assessment
Wellington Road

eight versa

+44 (0)20 7043 0418
info@eightversa.com

Conclusion

Summary

A full planning application to provide 21no. Class C3 units, including related ancillary functions, amenity space, landscaping, car and cycle parking and refuse storage. The development is located in the Wokingham borough council with a total GIA of approx. 1,207 sqm.

The entire scheme has been modelled for the purpose of the energy assessment.

The scheme complies with the 2021 Building Regulations Part L and the minimum energy efficiency targets in the following documents have been followed:

- New build CO_2 emissions – The actual CO_2 Dwelling Emissions Rate (DER) is no greater than the notional building CO_2 Target Emissions Rate (TER).
- New dwelling Fabric efficiency – The Dwelling Fabric Energy Efficiency (DFEE) is not greater than the Target Fabric Energy Efficiency (TFEE).
- New build Primary energy – The Dwelling Primary Energy Rate (DPER) is no greater than the Target Primary Energy Rate (TPER).

In addition, the CO_2 emissions of the scheme have been calculated using the SAP 10.2 carbon emission factors, and the scheme can achieve:

- An on-site CO_2 reduction of 85% beyond Building Regulations through energy efficiency measures and inclusion of renewable technologies (Air Source Heat Pumps and PV panels)
- An on-site CO_2 reduction of 21% through energy efficiency measures, 'Be Lean' stage
- A further reduction in CO_2 of 64% through renewable technologies at the 'Be Green' stage (Air Source Heat Pumps and PV panels)
- An improvement of 1.15% in Fabric Energy Efficiency
- An improvement of 73.7% in Primary Energy Rate

Therefore, the scheme successfully demonstrates compliance with Building Regulations Part L 2021, Wokingham Local Plan (2014) and Sustainable Design and Construction SPD (2010).

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Appendix A

SAP files

The emission figures and details of the calculations and methodology used to determine the figures provided within the report can be found in the following pages:

- Summary of Carbon Emissions
- Be Lean – DER from the Be Lean scenario DER SAP worksheet
- Be Lean – Block compliance report
- Baseline – TER from the Be Green scenario TER SAP worksheet
- Be Green – DER from the Be Green scenario DER SAP worksheet
- Be Green – Block compliance report

Energy Assessment
Wellington Road

eight versa
+44 (0)20 7043 0418
info@eightversa.com

Summary of Carbon Emissions for all flats

House	Multiplier	Area (m^2)	Baseline TER ($kgCO_2/m^2$)	Lean DER ($kgCO_2/m^2$)	Green DER ($kgCO_2/m^2$)	TFEE (kWh/m^2)	DFEE (kWh/m^2)	TPER (kWh/m^2)	DPER (kWh/m^2)
FLAT 1	1	50.58	18.20	15.88	2.16	52.39	45.45	21.54	96.7
FLAT 10	1	52.43	12.44	11.52	2.19	26.69	25.72	22.28	65.69
FLAT 11	1	52.43	12.45	11.53	2.18	26.71	25.80	22.18	65.71
FLAT 12	1	60.03	12.82	12.13	1.54	31.55	31.67	15.31	67.71
FLAT 13	1	53.85	15.89	14.76	1.97	43.38	41.90	19.64	84.24
FLAT 14	1	51.16	18.18	17.64	2.46	52.66	53.17	24.64	96.59
FLAT 15	1	50.58	15.91	15.72	2.13	42.06	44.76	21.25	84.39
FLAT 16	1	77.6	13.01	12.38	1.72	38.43	38.44	17.25	68.49
FLAT 17	1	52.4	14.25	14.39	1.90	35.12	39.64	18.96	75.42
FLAT 18	1	52.43	14.11	14.43	1.91	34.48	39.83	19.04	74.65
FLAT 19	1	52.43	14.11	14.43	1.91	34.48	39.83	19.04	74.65
FLAT 2	1	53.72	16.63	14.88	1.99	46.50	42.22	19.9	88.23
FLAT 20	1	60.00	13.97	13.81	1.85	37.05	39.40	18.47	73.81
FLAT 21	1	67.26	15.14	14.93	2.10	45.13	46.56	21.06	79.99
FLAT 3	1	52.4	14.80	13.31	1.43	37.66	34.71	13.98	78.36
FLAT 4	1	52.4	14.58	13.36	1.74	36.67	34.91	17.33	77.19
FLAT 5	1	52.4	14.58	13.36	1.74	36.67	34.91	17.33	77.2
FLAT 6	1	60.03	13.80	12.84	1.67	36.07	35.33	16.66	72.97
FLAT 7	1	50.58	14.82	13.42	1.77	37.04	34.66	17.66	78.53
FLAT 8	1	77.69	8.56	11.90	1.64	37.57	36.31	16.37	45.89
FLAT 9	1	52.4	13.04	11.53	5.17	26.91	25.80	40.69	68.91

Energy Assessment
Wellington Road

+44 (0)20 7043 0418
info@eightversa.com

Be Lean – DER from the Be Lean scenario DER SAP worksheet

Full SAP Calculation Printout

Property Reference	FLAT 3	**Issued on Date**	17/06/2025
Assessment Reference	Flat 3	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	13.31	**TER**	15.40
Environmental	91 B	**% DER < TER**			13.57
CO_2 Emissions (t/year)	0.63	**DFEE**	34.71	**TFEE**	37.66
Compliance Check	See BREL	**% DFEE < TFEE**			7.84
% DPER < TPER	-3.47	**DPER**	84.45	**TPER**	81.62

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			8.3600	0.8687	7.2625			(27)
Door to Corridor			2.0000	0.9000	1.8000			(26)
opaque			2.6400	0.9000	2.3760			(26)
Ground Floor			52.4000	0.0900	4.7160			(28a)
External Wall 1	29.1400	11.0000	18.1400	0.1200	2.1768			(29a)
Int Exposeed wall	23.2300	2.0000	21.2300	0.1200	2.5476			(29a)
Total net area of external elements Aum(A, m2)			104.7700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.8789			(33)
Main dwelling								
Party Wall 1			30.7800	0.0000	0.0000			(32)
Party Ceiling 1			52.4300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	19.4000	0.1300	2.5220	
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0700	0.8750	
E16 Corner (normal)	8.1000	0.0900	0.7290	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E18 Party wall between dwellings	2.7000	0.0600	0.1620	
E25 Staggered party wall between dwellings	8.1000	0.0800	0.6480	
P1 Party wall - Ground floor	6.2000	0.2200	1.3640	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4000	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9000	0.0800	0.4720	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.0000	0.0500	1.3000	
P6 Party wall - Ground floor (inverted)	5.2000	0.0700	0.3640	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.5450 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4239 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	43.1334	42.9977	42.8620	42.1836	42.0479	41.3695	41.3695	41.2338	41.6408	42.0479	42.3193	42.5907	(39)

Average = Sum(39)m / 12 = 42.1497

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8232	0.8206	0.8180	0.8050	0.8024	0.7895	0.7895	0.7869	0.7947	0.8024	0.8076	0.8128	(40)
HLP (average)												0.8044	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.0285	(64)
12Total per year (kWh/year)												2274	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.9762	50.2737	49.4760	51.5192	52.1756	58.3828	62.3342	69.6725	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	75.2368	69.8245	66.5000	69.2462	72.4661	78.4716	86.5753	93.6458	(72)
Total internal gains	381.4033	389.6512	373.1243	358.8210	340.1656	324.3111	311.5220	312.6757	322.6019	337.4572	359.0384	373.5512	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	432.5628	476.7946	492.3578	506.5570	505.6423	488.5911	469.9055	457.8239	451.7065	433.7693	420.3156	417.3330	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.3636	84.6298	84.8977	86.2631	86.5415	87.9608	87.9608	88.2502	87.3875	86.5415	85.9866	85.4387	
alpha	6.6242	6.6420	6.6598	6.7509	6.7694	6.8641	6.8641	6.8833	6.8258	6.7694	6.7324	6.6959	
util living area	0.9861	0.9722	0.9471	0.8743	0.7378	0.5382	0.3870	0.4137	0.6252	0.8748	0.9679	0.9885	(86)
MIT	20.3610	20.5023	20.6621	20.8525	20.9607	20.9960	20.9996	20.9994	20.9893	20.8737	20.6042	20.3396	(87)
Th 2	20.2333	20.2355	20.2378	20.2490	20.2512	20.2624	20.2624	20.2647	20.2580	20.2512	20.2467	20.2423	(88)
util rest of house	0.9822	0.9649	0.9333	0.8451	0.6891	0.4778	0.3223	0.3479	0.5625	0.8405	0.9582	0.9853	(89)
MIT 2	19.5009	19.6789	19.8765	20.1071	20.2201	20.2602	20.2623	20.2645	20.2514	20.1357	19.8167	19.4814	(90)
Living area fraction										fLA = Living area / (4) =		0.4943	(91)
MIT	19.9260	20.0859	20.2648	20.4756	20.5861	20.6239	20.6268	20.6278	20.6161	20.5004	20.2059	19.9056	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7760	19.9359	20.1148	20.3256	20.4361	20.4739	20.4768	20.4778	20.4661	20.3504	20.0559	19.7556	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9615	0.9308	0.8483	0.7015	0.4953	0.3412	0.3670	0.5804	0.8454	0.9553	0.9827	(94)
Useful gains	423.6376	458.4412	458.2708	429.7202	354.7329	241.9853	160.3135	168.0335	262.1628	366.7267	401.5198	410.1325	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	667.5333	646.5079	583.5566	481.9709	367.3360	243.0005	160.3795	168.1413	265.0890	409.9857	548.2854	662.5235	(97)
Space heating kWh	181.4584	126.3808	93.2126	37.6205	9.3766	0.0000	0.0000	0.0000	0.0000	32.1847	105.6712	187.7789	(98a)
Space heating requirement - total per year (kWh/year)												773.6838	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	181.4584	126.3808	93.2126	37.6205	9.3766	0.0000	0.0000	0.0000	0.0000	32.1847	105.6712	187.7789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												773.6838	
Space heating per m2											(98c) / (4) =	14.7650	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	181.4584	126.3808	93.2126	37.6205	9.3766	0.0000	0.0000	0.0000	0.0000	32.1847	105.6712	187.7789	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	202.7469	141.2076	104.1482	42.0341	10.4767	0.0000	0.0000	0.0000	0.0000	35.9606	118.0684	209.8088	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	194.0168	170.7206	179.3699	153.1307	145.2899	127.5083	123.4469	130.3128	133.8995	153.3771	168.0360	191.3144	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2662	57.1437	63.2662	61.2254	63.2662	61.2254	63.2662	63.2662	61.2254	63.2662	61.2254	63.2662	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 864.4512 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 1870.4229 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020) 103.9086 (230a)

central heating pump 41.0000 (230c)

maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)

Total electricity for the above, kWh/year	744.9086	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3615.2773	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	864.4512	0.2100	181.5347	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.4229	0.2100	392.7888	(264)
Space and water heating			574.3236	(265)
Pumps, fans and electric keep-hot	744.9086	0.1387	103.3280	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Total CO2, kg/year			697.2076	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.3100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	864.4512	1.1300	976.8298	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.4229	1.1300	2113.5779	(278)
Space and water heating			3090.4077	(279)
Pumps, fans and electric keep-hot	744.9086	1.5128	1126.8977	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Total Primary energy kWh/year			4425.1315	(286)
Dwelling Primary energy Rate (DPER)			84.4500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b) x	2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.4800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3033	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.6400	1.0000	4.6400			(26)
TER Opening Type			8.3600	1.1450	9.5725			(27)
Ground Floor			52.4000	0.1300	6.8120			(28a)
External Wall 1	29.1400	11.0000	18.1400	0.1800	3.2652			(29a)
Int Exposeed wall	23.2300	2.0000	21.2300	0.1800	3.8214			(29a)
Total net area of external elements Aum(A, m2)			104.7700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1111			(33)
Main dwelling								
Party Wall 1			30.7800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	19.4000	0.1600	3.1040
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0700	0.8750
E16 Corner (normal)	8.1000	0.0900	0.7290
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E18 Party wall between dwellings	2.7000	0.0600	0.1620
E25 Staggered party wall between dwellings	8.1000	0.0600	0.4860
P1 Party wall - Ground floor	6.2000	0.0800	0.4960
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9000	0.0200	0.1180
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.0000	0.0500	1.3000
P6 Party wall - Ground floor (inverted)	5.2000	0.0700	0.3640

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8810 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.9921 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff	62.8274	62.6919	62.5590	61.9348	61.8181	61.2745	61.2745	61.1738	61.4839	61.8181	62.0543	62.3013	(39)

Average = Sum(39)m / 12 = 61.9343

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1990	1.1964	1.1939	1.1820	1.1797	1.1694	1.1694	1.1674	1.1734	1.1797	1.1842	1.1890	(40)
HLP (average)												1.1820	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2234	45.7690	46.5531	47.9995	47.9273	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	179.2578	159.8890	157.0381	164.6294	167.7674	188.2314	199.7073	222.1853	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
										Total per year (kWh/year) = Sum(64)m =		2031.7064	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.5423	49.3871	48.3745	50.7793	51.8286	58.3828	62.3342	69.6725	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	74.6536	68.5933	65.0195	68.2518	71.9842	78.4716	86.5753	93.6458	(72)
Total internal gains	381.4033	389.6512	373.1243	358.8210	339.5824	323.0798	310.0415	311.6813	322.1201	337.4572	359.0384	373.5512	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.6300	0.7000	0.7700	24.7383	(77)
Southwest	6.1600	36.7938	0.6300	0.7000	0.7700	69.2672	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	94.0055	160.1261	219.0915	271.4650	304.0634	301.8646	291.0297	266.7098	237.2298	176.9734	112.5969	80.4491	(83)
Total gains	475.4088	549.7773	592.2158	630.2860	643.6458	624.9444	601.0712	578.3911	559.3498	514.4306	471.6353	454.0003	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.9188	58.0441	58.1673	58.7535	58.8645	59.3867	59.3867	59.4844	59.1845	58.8645	58.6404	58.4079	
alpha	4.8613	4.8696	4.8778	4.9169	4.9243	4.9591	4.9591	4.9656	4.9456	4.9243	4.9094	4.8939	
util living area	0.9882	0.9757	0.9528	0.8941	0.7811	0.6028	0.4439	0.4794	0.7006	0.9091	0.9759	0.9904	(86)
MIT	19.8252	20.0406	20.3042	20.6220	20.8532	20.9685	20.9943	20.9917	20.9341	20.6434	20.1821	19.7873	(87)
Th 2	19.9208	19.9229	19.9249	19.9345	19.9362	19.9446	19.9446	19.9461	19.9414	19.9362	19.9326	19.9288	(88)
util rest of house	0.9846	0.9684	0.9385	0.8628	0.7216	0.5137	0.3399	0.3733	0.6144	0.8752	0.9674	0.9874	(89)
MIT 2	18.5852	18.8571	19.1851	19.5700	19.8196	19.9277	19.9429	19.9434	19.9009	19.6049	19.0454	18.5431	(90)
Living area fraction									fLA = Living area / (4) =			0.4943	(91)
MIT	19.1981	19.4421	19.7382	20.0900	20.3304	20.4421	20.4626	20.4615	20.4116	20.1182	19.6073	19.1581	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1981	19.4421	19.7382	20.0900	20.3304	20.4421	20.4626	20.4615	20.4116	20.1182	19.6073	19.1581	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9814	0.9644	0.9355	0.8679	0.7450	0.5568	0.3914	0.4259	0.6545	0.8818	0.9641	0.9846	(94)
Useful gains	466.5548	530.1790	554.0271	547.0027	479.5231	347.9648	235.2597	246.3110	366.0765	453.6219	454.7028	447.0034	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	936.0072	911.6715	828.1693	693.0502	533.5174	357.9740	236.6761	248.4591	388.0600	588.3959	776.1307	931.9068	(97)
Space heating kWh	349.2726	256.3630	203.9618	105.1542	40.1718	0.0000	0.0000	0.0000	0.0000	100.2718	231.4281	360.7681	(98a)
Space heating requirement - total per year (kWh/year)												1647.3914	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	349.2726	256.3630	203.9618	105.1542	40.1718	0.0000	0.0000	0.0000	0.0000	100.2718	231.4281	360.7681	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1647.3914	
Space heating per m2											(98c) / (4) =	31.4388	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	349.2726	256.3630	203.9618	105.1542	40.1718	0.0000	0.0000	0.0000	0.0000	100.2718	231.4281	360.7681	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	378.0006	277.4491	220.7379	113.8033	43.4759	0.0000	0.0000	0.0000	0.0000	108.5193	250.4633	390.4417	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.5630	85.1731	84.5480	83.4117	81.8762	80.3000	80.3000	80.3000	80.3000	83.2904	84.9335	85.6488	(217)
Fuel for water heating, kWh/month	233.7864	207.9212	223.2357	200.8425	197.4918	180.4029	178.0251	186.3669	189.5660	203.9907	210.6885	231.2594	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0239	-26.3350	-39.2250	-45.7701	-50.8286	-48.0115	-47.4556	-44.0892	-38.3703	-30.8829	-20.1524	-15.4789	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5508	-16.1272	-32.5000	-49.4586	-66.0119	-66.5232	-65.7090	-55.3273	-40.1700	-23.2407	-10.1410	-5.9506	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

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

Annual totals kWh/year		
Space heating fuel - main system 1	1782.8912	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2443.5771	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3584.6291	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1782.8912	0.2100	374.4071	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2443.5771	0.2100	513.1512	(264)
Space and water heating			887.5583	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	0.1338	-56.8217	
PV Unit electricity exported	-438.7103	0.1255	-55.0685	
Total			-111.8902	(269)
Total CO2, kg/year			807.1535	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.4000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1782.8912	1.1300	2014.6670	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2443.5771	1.1300	2761.2421	(278)
Space and water heating			4775.9091	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	1.4945	-634.6082	
PV Unit electricity exported	-438.7103	0.4607	-202.1319	
Total			-836.7401	(283)
Total Primary energy kWh/year			4277.0959	(286)
Target Primary Energy Rate (TPER)			81.6200	(287)

Full SAP Calculation Printout

Property Reference	FLAT 4	**Issued on Date**	17/06/2025
Assessment Reference	Flat 4	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	13.36	**TER**	15.18
Environmental	91 B	**% DER < TER**			11.99
CO_2 Emissions (t/year)	0.63	**DFEE**	34.91	**TFEE**	36.67
Compliance Check	See BREL	**% DFEE < TFEE**			4.80
% DPER < TPER	-5.35	**DPER**	84.72	**TPER**	80.42

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			8.3600	0.8687	7.2625			(27)
Door to sCorridor			2.0000	0.9000	1.8000			(26)
Opaque			2.6400	0.9000	2.3760			(26)
Ground Floor			52.4000	0.0900	4.7160			(28a)
External Wall 1	29.1100	11.0000	18.1100	0.1200	2.1732			(29a)
Int Exposed wall	20.5200	2.0000	18.5200	0.1200	2.2224			(29a)
Total net area of external elements Aum(A, m2)			102.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.5501			(33)
Main dwelling								
Party Wall 1			33.5300	0.0000	0.0000			(32)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	18.3700	0.1300	2.3881	
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
P1 Party wall - Ground floor	12.4500	0.2200	2.7390	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4500	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4800	0.0800	0.5984	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.0000	0.0500	1.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1395 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.6896 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)

Heat transfer coeff

	43.3991	43.2634	43.1277	42.4493	42.3136	41.6352	41.6352	41.4995	41.9065	42.3136	42.5850	42.8564	(39)

Average = Sum(39)m / 12 = 42.4154

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8282	0.8256	0.8230	0.8101	0.8075	0.7946	0.7946	0.7920	0.7997	0.8075	0.8127	0.8179	(40)
HLP (average)												0.8095	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

	53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376 (42a)

Hot water usage for baths

	23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562 (42b)

Hot water usage for other uses

	32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631 (42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)

Energy content (annual) Total = Sum(45)m = 1674.0285

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

	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840 (46)

Water storage loss:

Total storage loss

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

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)

Total heat required for water heating calculated for each month

	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853 (64)

Total per year (kWh/year) = Sum(64)m = 2274.0285 (64)

12Total per year (kWh/year) 2274 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

	70.4767	62.3112	66.1180	57.8986	55.9762	50.2737	49.4760	51.5192	52.1756	58.3828	62.3342	69.6725 (65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)

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

	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)

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

	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)

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

	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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

	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)

Water heating gains (Table 5)

	94.7267	92.7249	88.8682	80.4147	75.2368	69.8245	66.5000	69.2462	72.4661	78.4716	86.5753	93.6458	(72)

Total internal gains

	381.4033	389.6512	373.1243	358.8210	340.1656	324.3111	311.5220	312.6757	322.6019	337.4572	359.0384	373.5512	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	432.5628	476.7946	492.3578	506.5570	505.6423	488.5911	469.9055	457.8239	451.7065	433.7693	420.3156	417.3330	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.8471	84.1101	84.3747	85.7232	85.9981	87.3994	87.3994	87.6852	86.8334	85.9981	85.4501	84.9090	
alpha	6.5898	6.6073	6.6250	6.7149	6.7332	6.8266	6.8266	6.8457	6.7889	6.7332	6.6967	6.6606	
util living area	0.9863	0.9727	0.9480	0.8763	0.7410	0.5414	0.3895	0.4164	0.6286	0.8769	0.9685	0.9887	(86)
MIT	20.3521	20.4939	20.6550	20.8480	20.9589	20.9957	20.9996	20.9994	20.9886	20.8697	20.5970	20.3307	(87)
Th 2	20.2289	20.2312	20.2334	20.2446	20.2468	20.2580	20.2580	20.2603	20.2536	20.2468	20.2423	20.2379	(88)
util rest of house	0.9825	0.9654	0.9344	0.8473	0.6922	0.4804	0.3240	0.3497	0.5654	0.8428	0.9589	0.9855	(89)
MIT 2	19.4863	19.6649	19.8642	20.0981	20.2142	20.2557	20.2579	20.2601	20.2466	20.1275	19.8042	19.4666	(90)
Living area fraction									fLA = Living area / (4) =			0.4739	(91)
MIT	19.8966	20.0578	20.2389	20.4534	20.5671	20.6064	20.6094	20.6104	20.5982	20.4792	20.1799	19.8761	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7466	19.9078	20.0889	20.3034	20.4171	20.4564	20.4594	20.4604	20.4482	20.3292	20.0299	19.7261	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9618	0.9314	0.8498	0.7036	0.4969	0.3418	0.3678	0.5822	0.8468	0.9557	0.9828	(94)
Useful gains	423.6899	458.5910	458.5911	430.4658	355.7800	242.7638	160.6158	168.3908	262.9763	367.3302	401.6786	410.1729	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	670.3673	649.2868	586.0600	484.0675	368.8507	243.8306	160.6854	168.5045	266.0312	411.6775	550.6201	665.3909	(97)
Space heating kWh	183.5280	128.1475	94.8369	38.5932	9.7246	0.0000	0.0000	0.0000	0.0000	32.9943	107.2379	189.8822	(98a)
Space heating requirement - total per year (kWh/year)												784.9447	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	183.5280	128.1475	94.8369	38.5932	9.7246	0.0000	0.0000	0.0000	0.0000	32.9943	107.2379	189.8822	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												784.9447	
Space heating per m2											(98c) / (4) =	14.9799	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	183.5280	128.1475	94.8369	38.5932	9.7246	0.0000	0.0000	0.0000	0.0000	32.9943	107.2379	189.8822	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	205.0593	143.1816	105.9630	43.1209	10.8655	0.0000	0.0000	0.0000	0.0000	36.8652	119.8188	212.1588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	194.0168	170.7206	179.3699	153.1307	145.2899	127.5083	123.4469	130.3128	133.8995	153.3771	168.0360	191.3144	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2662	57.1437	63.2662	61.2254	63.2662	61.2254	63.2662	63.2662	61.2254	63.2662	61.2254	63.2662	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 877.0331 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 1870.4229 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020) 103.9086 (230a)

central heating pump 41.0000 (230c)

maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)

Total electricity for the above, kWh/year 744.9086 (231)

Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3627.8592	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	877.0331	0.2100	184.1770	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.4229	0.2100	392.7888	(264)
Space and water heating			576.9658	(265)
Pumps, fans and electric keep-hot	744.9086	0.1387	103.3280	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Total CO2, kg/year			699.8498	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.3600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	877.0331	1.1300	991.0475	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.4229	1.1300	2113.5779	(278)
Space and water heating			3104.6254	(279)
Pumps, fans and electric keep-hot	744.9086	1.5128	1126.8977	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Total Primary energy kWh/year			4439.3492	(286)
Dwelling Primary energy Rate (DPER)			84.7200	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.4800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3033	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							

TER Opaque door			4.6400	1.0000	4.6400		(26)
TER Opening Type			8.3600	1.1450	9.5725		(27)
Ground Floor			52.4000	0.1300	6.8120		(28a)
External Wall 1	29.1100	11.0000	18.1100	0.1800	3.2598		(29a)
Int Exposed wall	20.5200	2.0000	18.5200	0.1800	3.3336		(29a)
Total net area of external elements Aum(A, m2)			102.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6179		(33)
Main dwelling							
Party Wall 1			33.5300	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.3700	0.1600	2.9392
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
P1 Party wall - Ground floor	12.4500	0.0800	0.9960
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4800	0.0200	0.1496
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.0000	0.0500	1.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.5288 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	35.1467 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff	61.9820	61.8465	61.7136	61.0894	60.9727	60.4291	60.4291	60.3284	60.6385	60.9727	61.2089	61.4559	(39)
Average = Sum(39)m / 12 =												61.0889	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1829	1.1803	1.1777	1.1658	1.1636	1.1532	1.1532	1.1513	1.1572	1.1636	1.1681	1.1728	(40)
HLP (average)												1.1658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7609	(42)
Hot water usage for mixer showers	53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)
Hot water usage for baths	23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)
Hot water usage for other uses	32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)
Average daily hot water use (litres/day)												100.7857	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2234	45.7690	46.5531	47.9995	47.9273	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	179.2578	159.8890	157.0381	164.6294	167.7674	188.2314	199.7073	222.1853	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
									Total per year (kWh/year) = Sum(64)m =			2031.7064	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.5423	49.3871	48.3745	50.7793	51.8286	58.3828	62.3342	69.6725	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	74.6536	68.5933	65.0195	68.2518	71.9842	78.4716	86.5753	93.6458	(72)
Total internal gains	381.4033	389.6512	373.1243	358.8210	339.5824	323.0798	310.0415	311.6813	322.1201	337.4572	359.0384	373.5512	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.6300	0.7000	0.7700	24.7383	(77)
Southwest	6.1600	36.7938	0.6300	0.7000	0.7700	69.2672	(79)

Solar gains	94.0055	160.1261	219.0915	271.4650	304.0634	301.8646	291.0297	266.7098	237.2298	176.9734	112.5969	80.4491 (83)
Total gains	475.4088	549.7773	592.2158	630.2860	643.6458	624.9444	601.0712	578.3911	559.3498	514.4306	471.6353	454.0003 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.7088	58.8375	58.9642	59.5666	59.6807	60.2175	60.2175	60.3180	60.0096	59.6807	59.4503	59.2114	
alpha	4.9139	4.9225	4.9309	4.9711	4.9787	5.0145	5.0145	5.0212	5.0006	4.9787	4.9634	4.9474	
util living area	0.9881	0.9752	0.9516	0.8913	0.7760	0.5963	0.4382	0.4735	0.6945	0.9067	0.9754	0.9903	(86)
MIT	19.8503	20.0650	20.3257	20.6382	20.8620	20.9712	20.9949	20.9925	20.9389	20.6578	20.2032	19.8126	(87)
Th 2	19.9337	19.9358	19.9378	19.9474	19.9492	19.9576	19.9576	19.9592	19.9544	19.9492	19.9456	19.9418	(88)
util rest of house	0.9844	0.9678	0.9371	0.8596	0.7166	0.5086	0.3366	0.3696	0.6091	0.8724	0.9668	0.9873	(89)
MIT 2	18.6263	18.8972	19.2214	19.5992	19.8399	19.9422	19.9561	19.9567	19.9169	19.6317	19.0814	18.5845	(90)
Living area fraction									fLA = Living area / (4) =			0.4739	(91)
MIT	19.2063	19.4506	19.7447	20.0915	20.3242	20.4298	20.4483	20.4475	20.4012	20.1179	19.6130	19.1664	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2063	19.4506	19.7447	20.0915	20.3242	20.4298	20.4483	20.4475	20.4012	20.1179	19.6130	19.1664	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9811	0.9636	0.9340	0.8645	0.7390	0.5494	0.3849	0.4189	0.6473	0.8787	0.9633	0.9844	(94)
Useful gains	466.4174	529.7842	553.1298	544.8651	475.6860	343.3275	231.3275	242.3127	362.0518	452.0133	454.3432	446.9027	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	923.9227	899.9001	817.3756	683.6817	525.8424	352.2893	232.5506	244.1809	382.0934	580.3329	765.9054	919.7750	(97)
Space heating kWh	340.3839	248.7179	196.5989	99.9479	37.3163	0.0000	0.0000	0.0000	0.0000	95.4698	224.3248	351.8170	(98a)
Space heating requirement - total per year (kWh/year)												1594.5766	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	340.3839	248.7179	196.5989	99.9479	37.3163	0.0000	0.0000	0.0000	0.0000	95.4698	224.3248	351.8170	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1594.5766	
Space heating per m2											(98c) / (4) =	30.4308	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	340.3839	248.7179	196.5989	99.9479	37.3163	0.0000	0.0000	0.0000	0.0000	95.4698	224.3248	351.8170	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	368.3809	269.1752	212.7694	108.1688	40.3857	0.0000	0.0000	0.0000	0.0000	103.3223	242.7758	380.7543	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.5102	85.1091	84.4690	83.3116	81.7835	80.3000	80.3000	80.3000	80.3000	83.1954	84.8668	85.5979	(217)
Fuel for water heating, kWh/month	233.9307	208.0777	223.4445	201.0839	197.7157	180.4029	178.0251	186.3669	189.5660	204.2236	210.8541	231.3970	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0239	-26.3350	-39.2250	-45.7701	-50.8286	-48.0115	-47.4556	-44.0892	-38.3703	-30.8829	-20.1524	-15.4789	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5508	-16.1272	-32.5000	-49.4586	-66.0119	-66.5232	-65.7090	-55.3273	-40.1700	-23.2407	-10.1410	-5.9506	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	1725.7322	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2445.0881	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3528.9812	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1725.7322	0.2100	362.4038	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2445.0881	0.2100	513.4685	(264)
Space and water heating			875.8723	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	0.1338	-56.8217	
PV Unit electricity exported	-438.7103	0.1255	-55.0685	
Total			-111.8902	(269)
Total CO2, kg/year			795.4674	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1725.7322	1.1300	1950.0774	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2445.0881	1.1300	2762.9496	(278)
Space and water heating			4713.0270	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	1.4945	-634.6082	
PV Unit electricity exported	-438.7103	0.4607	-202.1319	
Total			-836.7401	(283)
Total Primary energy kWh/year			4214.2138	(286)
Target Primary Energy Rate (TPER)			80.4200	(287)

Full SAP Calculation Printout

Property Reference	FLAT 5	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 5	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	13.36	**TER**	15.18
Environmental	91 B	**% DER < TER**			11.99
CO_2 Emissions (t/year)	0.63	**DFEE**	34.91	**TFEE**	36.67
Compliance Check	See BREL	**% DFEE < TFEE**			4.81
% DPER < TPER	-5.33	**DPER**	84.72	**TPER**	80.43

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000 (1b)	x	2.7000 (2b)	=	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			8.3600	0.8687	7.2625			(27)
Door to sCorridor			2.0000	0.9000	1.8000			(26)
Opaque			2.6400	0.9000	2.3760			(26)
Ground Floor			52.4000	0.0900	4.7160			(28a)
External Wall 1	29.1100	11.0000	18.1100	0.1200	2.1732			(29a)
Int Exposed wall	20.5200	2.0000	18.5200	0.1200	2.2224			(29a)
Total net area of external elements Aum(A, m2)			102.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.5501			(33)
Main dwelling								
Party Wall 1			33.5300	0.0000	0.0000			(32)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	18.3700	0.1300	2.3881	
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
P1 Party wall - Ground floor	12.4500	0.2200	2.7390	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4500	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4400	0.0800	0.5952	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.0000	0.0500	1.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1363 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.6864 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	43.3959	43.2602	43.1245	42.4461	42.3104	41.6320	41.6320	41.4963	41.9033	42.3104	42.5818	42.8532	(39)
Average = Sum(39)m / 12 =												42.4122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8282	0.8256	0.8230	0.8100	0.8075	0.7945	0.7945	0.7919	0.7997	0.8075	0.8126	0.8178	(40)
HLP (average)												0.8094	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)
Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.0285	(64)
12Total per year (kWh/year)												2274	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.9762	50.2737	49.4760	51.5192	52.1756	58.3828	62.3342	69.6725	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	75.2368	69.8245	66.5000	69.2462	72.4661	78.4716	86.5753	93.6458	(72)
Total internal gains	381.4033	389.6512	373.1243	358.8210	340.1656	324.3111	311.5220	312.6757	322.6019	337.4572	359.0384	373.5512	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	432.5628	476.7946	492.3578	506.5570	505.6423	488.5911	469.9055	457.8239	451.7065	433.7693	420.3156	417.3330	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.8533	84.1163	84.3810	85.7297	86.0046	87.4061	87.4061	87.6919	86.8401	86.0046	85.4565	84.9153	
alpha	6.5902	6.6078	6.6254	6.7153	6.7336	6.8271	6.8271	6.8461	6.7893	6.7336	6.6971	6.6610	
util living area	0.9863	0.9727	0.9480	0.8763	0.7409	0.5413	0.3894	0.4163	0.6286	0.8768	0.9685	0.9887	(86)
MIT	20.3522	20.4940	20.6551	20.8480	20.9589	20.9957	20.9996	20.9994	20.9887	20.8698	20.5971	20.3308	(87)
Th 2	20.2290	20.2312	20.2335	20.2446	20.2469	20.2581	20.2581	20.2603	20.2536	20.2469	20.2424	20.2379	(88)
util rest of house	0.9825	0.9654	0.9343	0.8473	0.6921	0.4804	0.3240	0.3497	0.5653	0.8427	0.9589	0.9855	(89)
MIT 2	19.4865	19.6651	19.8644	20.0982	20.2143	20.2557	20.2580	20.2601	20.2466	20.1276	19.8044	19.4668	(90)
Living area fraction									fLA = Living area / (4) =			0.4752	(91)
MIT	19.8979	20.0590	20.2401	20.4545	20.5681	20.6074	20.6104	20.6114	20.5992	20.4803	20.1811	19.8774	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7479	19.9090	20.0901	20.3045	20.4181	20.4574	20.4604	20.4614	20.4492	20.3303	20.0311	19.7274	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9618	0.9314	0.8498	0.7036	0.4969	0.3419	0.3679	0.5822	0.8469	0.9557	0.9828	(94)
Useful gains	423.6920	458.5944	458.5961	430.4741	355.7948	242.7871	160.6458	168.4199	262.9980	367.3403	401.6824	410.1747	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	670.3743	649.2925	586.0672	484.0771	368.8669	243.8543	160.7155	168.5337	266.0538	411.6915	550.6289	665.3969	(97)
Space heating kWh	183.5316	128.1492	94.8385	38.5942	9.7256	0.0000	0.0000	0.0000	0.0000	32.9973	107.2415	189.8853	(98a)
Space heating requirement - total per year (kWh/year)												784.9631	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	183.5316	128.1492	94.8385	38.5942	9.7256	0.0000	0.0000	0.0000	0.0000	32.9973	107.2415	189.8853	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												784.9631	
Space heating per m2											(98c) / (4) =	14.9802	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	183.5316	128.1492	94.8385	38.5942	9.7256	0.0000	0.0000	0.0000	0.0000	32.9973	107.2415	189.8853	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	205.0633	143.1834	105.9648	43.1220	10.8666	0.0000	0.0000	0.0000	0.0000	36.8685	119.8229	212.1623	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	194.0168	170.7206	179.3699	153.1307	145.2899	127.5083	123.4469	130.3128	133.8995	153.3771	168.0360	191.3144	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2662	57.1437	63.2662	61.2254	63.2662	61.2254	63.2662	63.2662	61.2254	63.2662	61.2254	63.2662	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 877.0537 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 1870.4229 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020) 103.9086 (230a)

central heating pump 41.0000 (230c)

maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)

Total electricity for the above, kWh/year 744.9086 (231)

Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3627.8798	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	877.0537	0.2100	184.1813	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.4229	0.2100	392.7888	(264)
Space and water heating			576.9701	(265)
Pumps, fans and electric keep-hot	744.9086	0.1387	103.3280	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Total CO2, kg/year			699.8542	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.3600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	877.0537	1.1300	991.0707	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.4229	1.1300	2113.5779	(278)
Space and water heating			3104.6486	(279)
Pumps, fans and electric keep-hot	744.9086	1.5128	1126.8977	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Total Primary energy kWh/year			4439.3724	(286)
Dwelling Primary energy Rate (DPER)			84.7200	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.4800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3033	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							

TER Opaque door			4.6400	1.0000	4.6400		(26)
TER Opening Type			8.3600	1.1450	9.5725		(27)
Ground Floor			52.4000	0.1300	6.8120		(28a)
External Wall 1	29.1100	11.0000	18.1100	0.1800	3.2598		(29a)
Int Exposed wall	20.5200	2.0000	18.5200	0.1800	3.3336		(29a)
Total net area of external elements Aum(A, m2)			102.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6179		(33)
Main dwelling							
Party Wall 1			33.5300	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.3700	0.1600	2.9392
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
P1 Party wall - Ground floor	12.4500	0.0800	0.9960
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4400	0.0200	0.1488
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.0000	0.0500	1.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.5280 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	35.1459 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff	61.9812	61.8457	61.7128	61.0886	60.9719	60.4283	60.4283	60.3276	60.6377	60.9719	61.2081	61.4551	(39)
Average = Sum(39)m / 12 =												61.0881	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1828	1.1803	1.1777	1.1658	1.1636	1.1532	1.1532	1.1513	1.1572	1.1636	1.1681	1.1728	(40)
HLP (average)												1.1658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2234	45.7690	46.5531	47.9995	47.9273	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	179.2578	159.8890	157.0381	164.6294	167.7674	188.2314	199.7073	222.1853	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
									Total per year (kWh/year) = Sum(64)m =			2031.7064	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.5423	49.3871	48.3745	50.7793	51.8286	58.3828	62.3342	69.6725	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	74.6536	68.5933	65.0195	68.2518	71.9842	78.4716	86.5753	93.6458	(72)
Total internal gains	381.4033	389.6512	373.1243	358.8210	339.5824	323.0798	310.0415	311.6813	322.1201	337.4572	359.0384	373.5512	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.6300	0.7000	0.7700	24.7383	(77)
Southwest	6.1600	36.7938	0.6300	0.7000	0.7700	69.2672	(79)

Solar gains	94.0055	160.1261	219.0915	271.4650	304.0634	301.8646	291.0297	266.7098	237.2298	176.9734	112.5969	80.4491 (83)
Total gains	475.4088	549.7773	592.2158	630.2860	643.6458	624.9444	601.0712	578.3911	559.3498	514.4306	471.6353	454.0003 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.7095	58.8382	58.9649	59.5674	59.6814	60.2183	60.2183	60.3188	60.0104	59.6814	59.4511	59.2122	
alpha	4.9140	4.9225	4.9310	4.9712	4.9788	5.0146	5.0146	5.0213	5.0007	4.9788	4.9634	4.9475	
util living area	0.9881	0.9752	0.9516	0.8913	0.7760	0.5963	0.4382	0.4735	0.6945	0.9066	0.9754	0.9903	(86)
MIT	19.8503	20.0650	20.3257	20.6382	20.8620	20.9712	20.9949	20.9925	20.9389	20.6578	20.2033	19.8126	(87)
Th 2	19.9337	19.9358	19.9379	19.9474	19.9492	19.9576	19.9576	19.9592	19.9544	19.9492	19.9456	19.9418	(88)
util rest of house	0.9844	0.9678	0.9371	0.8596	0.7166	0.5086	0.3366	0.3696	0.6091	0.8724	0.9668	0.9873	(89)
MIT 2	18.6264	18.8972	19.2214	19.5992	19.8399	19.9422	19.9561	19.9567	19.9169	19.6317	19.0814	18.5846	(90)
Living area fraction									fLA = Living area / (4) =			0.4752	(91)
MIT	19.2080	19.4521	19.7462	20.0929	20.3256	20.4312	20.4497	20.4489	20.4025	20.1193	19.6145	19.1681	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2080	19.4521	19.7462	20.0929	20.3256	20.4312	20.4497	20.4489	20.4025	20.1193	19.6145	19.1681	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9811	0.9636	0.9340	0.8645	0.7391	0.5495	0.3850	0.4191	0.6474	0.8787	0.9634	0.9844	(94)
Useful gains	466.4213	529.7919	553.1436	544.8922	475.7340	343.3968	231.4064	242.3901	362.1120	452.0376	454.3506	446.9058	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	924.0141	899.9869	817.4578	683.7588	525.9196	352.3682	232.6318	244.2616	382.1718	580.4101	765.9888	919.8658	(97)
Space heating kWh	340.4491	248.7710	196.6498	99.9839	37.3380	0.0000	0.0000	0.0000	0.0000	95.5091	224.3795	351.8822	(98a)
Space heating requirement - total per year (kWh/year)												1594.9627	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	340.4491	248.7710	196.6498	99.9839	37.3380	0.0000	0.0000	0.0000	0.0000	95.5091	224.3795	351.8822	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1594.9627	
Space heating per m2											(98c) / (4) =	30.4382	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	340.4491	248.7710	196.6498	99.9839	37.3380	0.0000	0.0000	0.0000	0.0000	95.5091	224.3795	351.8822	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	368.4514	269.2327	212.8244	108.2077	40.4091	0.0000	0.0000	0.0000	0.0000	103.3649	242.8349	380.8249	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.5106	85.1095	84.4695	83.3123	81.7842	80.3000	80.3000	80.3000	80.3000	83.1962	84.8674	85.5983	(217)
Fuel for water heating, kWh/month	233.9297	208.0766	223.4431	201.0822	197.7140	180.4029	178.0251	186.3669	189.5660	204.2216	210.8528	231.3960	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0239	-26.3350	-39.2250	-45.7701	-50.8286	-48.0115	-47.4556	-44.0892	-38.3703	-30.8829	-20.1524	-15.4789	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5508	-16.1272	-32.5000	-49.4586	-66.0119	-66.5232	-65.7090	-55.3273	-40.1700	-23.2407	-10.1410	-5.9506	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	1726.1501	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2445.0768	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3529.3877	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1726.1501	0.2100	362.4915	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2445.0768	0.2100	513.4661	(264)
Space and water heating			875.9576	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	0.1338	-56.8217	
PV Unit electricity exported	-438.7103	0.1255	-55.0685	
Total			-111.8902	(269)
Total CO2, kg/year			795.5528	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1726.1501	1.1300	1950.5496	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2445.0768	1.1300	2762.9368	(278)
Space and water heating			4713.4864	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	1.4945	-634.6082	
PV Unit electricity exported	-438.7103	0.4607	-202.1319	
Total			-836.7401	(283)
Total Primary energy kWh/year			4214.6732	(286)
Target Primary Energy Rate (TPER)			80.4300	(287)

Full SAP Calculation Printout

Property Reference	FLAT 6	**Issued on Date**	17/06/2025
Assessment Reference	Flat 6	**Prop Type Ref**	
Property			

SAP Rating	81 B	**DER**	12.84	**TER**	14.40
Environmental	91 B	**% DER < TER**			10.83
CO_2 Emissions (t/year)	0.69	**DFEE**	35.33	**TFEE**	36.07
Compliance Check	See BREL	**% DFEE < TFEE**			2.05
% DPER < TPER	-5.77	**DPER**	80.63	**TPER**	76.23

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0300	(1b)	x 2.7000	(2b) =	162.0810	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0300					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.0810	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			12.3200	0.8687	10.7027			(27)
OPAQUE			5.2800	0.9000	4.7520			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	53.0000	17.6000	35.4000	0.1200	4.2480			(29a)
EXPOSED WALL TO CORRIDOR	20.1200	2.2000	17.9200	0.1200	2.1504			(29a)
Total net area of external elements Aum(A, m2)			73.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.8331			(33)
Main dwelling								
Party Wall 1			16.6300	0.0000	0.0000			(32)
Party Floor 1			60.0300					(32d)
Party Ceiling 1			60.0300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	14.3500	0.0700	1.0045	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.4400	0.0800	0.6752	
E16 Corner (normal)	13.5000	0.0900	1.2150	
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860	
E25 Staggered party wall between dwellings	2.7000	0.0800	0.2160	
E18 Party wall between dwellings	2.7000	0.0600	0.1620	
P8 Party Wall - Exposed floor (inverted)	4.3600	0.2400	1.0464	
E5 Ground floor (normal)	27.1400	0.1300	3.5282	
P1 Party wall - Ground floor	6.1000	0.2200	1.3420	
E2 Other lintels (including other steel lintels)	9.0000	0.2000	1.8000	
E3 Sill	5.6000	0.0400	0.2240	
E4 Jamb	39.6000	0.0500	1.9800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.7073 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.5404 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.5601	14.4046	14.2492	13.4720	13.3165	12.5393	12.5393	12.3838	12.8502	13.3165	13.6274	13.9383	(38)
Heat transfer coeff	51.1005	50.9450	50.7896	50.0124	49.8569	49.0797	49.0797	48.9243	49.3906	49.8569	50.1678	50.4787	(39)

Average = Sum(39)m / 12 = 49.9735

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8512	0.8487	0.8461	0.8331	0.8305	0.8176	0.8176	0.8150	0.8228	0.8305	0.8357	0.8409	(40)
HLP (average)												0.8325	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9825 (42)

Hot water usage for mixer showers

57.4593	56.5958	55.3375	52.9300	51.1533	49.1720	48.0458	49.2945	50.6634	52.7908	55.2500	57.2391	(42a)

Hot water usage for baths

24.8326	24.4638	23.9445	22.9869	22.2698	21.4748	21.0453	21.5610	22.1226	22.9733	23.9506	24.7486	(42b)

Hot water usage for other uses

34.9326	33.6623	32.3920	31.1218	29.8515	28.5812	28.5812	29.8515	31.1218	32.3920	33.6623	34.9326	(42c)

Average daily hot water use (litres/day) 107.7562 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.2245	114.7219	111.6740	107.0386	103.2746	99.2280	97.6723	100.7071	103.9077	108.1561	112.8629	116.9204	(44)
Energy conte	185.6549	163.3625	171.6388	146.5305	139.0275	122.0123	118.1262	124.6964	128.1286	146.7668	160.7939	183.0691	(45)
Energy content (annual)										Total = Sum(45)m =		1789.8076	
Distribution loss (46)m = 0.15 x (45)m	27.8482	24.5044	25.7458	21.9796	20.8541	18.3019	17.7189	18.7045	19.2193	22.0150	24.1191	27.4604	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	236.6138	209.3899	222.5977	195.8456	189.9864	171.3274	169.0851	175.6553	177.4437	197.7257	210.1090	234.0280	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.6138	209.3899	222.5977	195.8456	189.9864	171.3274	169.0851	175.6553	177.4437	197.7257	210.1090	234.0280	(64)
										Total per year (kWh/year) = Sum(64)m =		2389.8076	(64)
12Total per year (kWh/year)												2390	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	74.4700	65.8249	69.8096	61.0502	58.9664	52.8979	52.0167	54.2013	54.9315	61.5397	65.7927	73.6102	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.6677	97.0607	87.6677	90.5900	87.6677	90.5900	87.6677	87.6677	90.5900	87.6677	90.5900	87.6677	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.0226	174.8180	170.2936	160.6616	148.5030	137.0755	129.4413	127.6459	132.1703	141.8023	153.9610	165.3884	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	(71)
Water heating gains (Table 5)	100.0941	97.9537	93.8301	84.7919	79.2559	73.4693	69.9149	72.8512	76.2938	82.7146	91.3788	98.9384	(72)
Total internal gains	416.5216	425.5696	407.5286	391.7807	371.1638	353.8720	339.7612	340.9020	351.7913	367.9219	391.6670	407.7317	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	75.3929	128.4219	175.7125	217.7163	243.8604	242.0969	233.4073	213.9026	190.2595	141.9336	90.3033	64.5206	(83)
Total gains	491.9145	553.9915	583.2411	609.4970	615.0242	595.9689	573.1684	554.8046	542.0508	509.8555	481.9702	472.2523	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.5794	81.8284	82.0788	83.3544	83.6143	84.9384	84.9384	85.2083	84.4037	83.6143	83.0961	82.5843	
alpha	6.4386	6.4552	6.4719	6.5570	6.5743	6.6626	6.6626	6.6806	6.6269	6.5743	6.5397	6.5056	
util living area	0.9876	0.9728	0.9443	0.8645	0.7211	0.5235	0.3764	0.4051	0.6176	0.8752	0.9706	0.9900	(86)
MIT	20.3059	20.4685	20.6489	20.8518	20.9617	20.9960	20.9996	20.9994	20.9886	20.8629	20.5652	20.2800	(87)
Th 2	20.2091	20.2114	20.2136	20.2247	20.2269	20.2381	20.2381	20.2404	20.2336	20.2269	20.2225	20.2180	(88)
util rest of house	0.9841	0.9655	0.9298	0.8338	0.6712	0.4628	0.3114	0.3385	0.5536	0.8403	0.9615	0.9872	(89)
MIT 2	19.4122	19.6170	19.8395	20.0832	20.1969	20.2359	20.2380	20.2401	20.2267	20.1016	19.7487	19.3867	(90)
Living area fraction										fLA = Living area / (4) =		0.4874	(91)
MIT	19.8478	20.0320	20.2340	20.4578	20.5697	20.6064	20.6092	20.6102	20.5980	20.4727	20.1467	19.8221	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6978	19.8820	20.0840	20.3078	20.4197	20.4564	20.4592	20.4602	20.4480	20.3227	19.9967	19.6721	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9619	0.9271	0.8373	0.6840	0.4803	0.3303	0.3578	0.5718	0.8451	0.9583	0.9847	(94)
Useful gains	482.6745	532.8592	540.7106	510.3532	420.6984	286.2714	189.3303	198.5092	309.9666	430.8584	461.8666	465.0108	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	786.8333	763.2591	689.9280	570.5328	434.7379	287.4309	189.4096	198.6428	313.5335	484.7433	646.9994	781.0135	(97)
Space heating kWh	226.2942	154.8287	111.0178	43.3293	10.4454	0.0000	0.0000	0.0000	0.0000	40.0903	133.2956	235.1060	(98a)
Space heating requirement - total per year (kWh/year)												954.4073	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	226.2942	154.8287	111.0178	43.3293	10.4454	0.0000	0.0000	0.0000	0.0000	40.0903	133.2956	235.1060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												954.4073	
Space heating per m2											(98c) / (4) =	15.8988	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	226.2942	154.8287	111.0178	43.3293	10.4454	0.0000	0.0000	0.0000	0.0000	40.0903	133.2956	235.1060	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	252.8427	172.9930	124.0422	48.4126	11.6709	0.0000	0.0000	0.0000	0.0000	44.7937	148.9336	262.6883	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	236.6138	209.3899	222.5977	195.8456	189.9864	171.3274	169.0851	175.6553	177.4437	197.7257	210.1090	234.0280	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	207.4357	182.5279	191.7752	163.7213	155.3380	136.3266	131.9846	139.3256	143.1605	163.9853	179.6580	204.5464	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	64.5512	58.3043	64.5512	62.4689	64.5512	62.4689	64.5512	64.5512	62.4689	64.5512	62.4689	64.5512	(231)
Lighting	18.2156	14.6132	13.1576	9.6398	7.4461	6.0835	6.7926	8.8292	11.4683	15.0470	16.9956	18.7219	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1066.3769 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 1999.7850 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020) 119.0388 (230a)

central heating pump 41.0000 (230c)

maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)

Total electricity for the above, kWh/year	760.0388	(231)
Electricity for lighting (calculated in Appendix L)	147.0105	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3973.2111	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1066.3769	0.2100	223.9391	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1999.7850	0.2100	419.9549	(264)
Space and water heating			643.8940	(265)
Pumps, fans and electric keep-hot	760.0388	0.1387	105.4267	(267)
Energy for lighting	147.0105	0.1443	21.2182	(268)
Total CO2, kg/year			770.5389	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.8400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1066.3769	1.1300	1205.0059	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1999.7850	1.1300	2259.7571	(278)
Space and water heating			3464.7629	(279)
Pumps, fans and electric keep-hot	760.0388	1.5128	1149.7867	(281)
Energy for lighting	147.0105	1.5338	225.4895	(282)
Total Primary energy kWh/year			4840.0391	(286)
Dwelling Primary energy Rate (DPER)			80.6300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0300	(1b) x	2.7000	(2b) =	162.0810	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.0810	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3734	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2894	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3690	0.3617	0.3545	0.3183	0.3111	0.2749	0.2749	0.2677	0.2894	0.3111	0.3256	0.3400	(22b)
Effective ac	0.5681	0.5654	0.5628	0.5507	0.5484	0.5378	0.5378	0.5358	0.5419	0.5484	0.5530	0.5578	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			7.4800	1.0000	7.4800			(26)
TER Opening Type			7.5200	1.1450	8.6107			(27)
External Wall 1	53.0000	12.8000	40.2000	0.1800	7.2360			(29a)
EXPOSED WALL TO CORRIDOR	20.1200	2.2000	17.9200	0.1800	3.2256			(29a)
Total net area of external elements Aum(A, m2)			73.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5523			(33)
Main dwelling								
Party Wall 1			16.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			250.0000 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.3500	0.0700	1.0045
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.4400	0.0200	0.1688
E16 Corner (normal)	13.5000	0.0900	1.2150
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
E25 Staggered party wall between dwellings	2.7000	0.0600	0.1620
E18 Party wall between dwellings	2.7000	0.0600	0.1620
P8 Party Wall - Exposed floor (inverted)	4.3600	0.2400	1.0464
E5 Ground floor (normal)	27.1400	0.1600	4.3424
P1 Party wall - Ground floor	6.1000	0.0800	0.4880
E2 Other lintels (including other steel lintels)	9.0000	0.0500	0.4500
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	39.6000	0.0500	1.9800
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.8131 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	37.3654 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.3840	30.2426	30.1041	29.4532	29.3314	28.7645	28.7645	28.6596	28.9829	29.3314	29.5778	29.8353	(38)
Heat transfer coeff	67.7494	67.6080	67.4694	66.8186	66.6968	66.1299	66.1299	66.0249	66.3483	66.6968	66.9432	67.2007	(39)
Average = Sum(39)m / 12 =												66.8180	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1286	1.1262	1.1239	1.1131	1.1111	1.1016	1.1016	1.0999	1.1053	1.1111	1.1152	1.1195	(40)
HLP (average)												1.1131	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9825 (42)
Hot water usage for mixer showers												
	57.4593	56.5958	55.3375	52.9300	51.1533	49.1720	48.0458	49.2945	50.6634	52.7908	55.2500	57.2391 (42a)
Hot water usage for baths												
	24.8326	24.4638	23.9445	22.9869	22.2698	21.4748	21.0453	21.5610	22.1226	22.9733	23.9506	24.7486 (42b)
Hot water usage for other uses												
	34.9326	33.6623	32.3920	31.1218	29.8515	28.5812	28.5812	29.8515	31.1218	32.3920	33.6623	34.9326 (42c)
Average daily hot water use (litres/day)												107.7562 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	117.2245	114.7219	111.6740	107.0386	103.2746	99.2280	97.6723	100.7071	103.9077	108.1561	112.8629	116.9204	(44)
Energy conte	185.6549	163.3625	171.6388	146.5305	139.0275	122.0123	118.1262	124.6964	128.1286	146.7668	160.7939	183.0691	(45)
Energy content (annual)										Total = Sum(45)m =		1789.8076	
Distribution loss (46)m = 0.15 x (45)m													
	27.8482	24.5044	25.7458	21.9796	20.8541	18.3019	17.7189	18.7045	19.2193	22.0150	24.1191	27.4604	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	48.9343	49.7727	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	236.6138	209.3899	222.5977	195.8456	189.9864	170.9467	167.8989	175.6553	177.4437	197.7257	210.1090	234.0280	(62)
WWHRS	-26.2680	-23.2316	-24.3268	-20.1436	-18.7731	-16.0643	-15.0577	-16.0123	-16.6207	-19.5940	-22.1976	-25.7815	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	210.3459	186.1582	198.2709	175.7020	171.2133	154.8824	152.8412	159.6430	160.8230	178.1318	187.9114	208.2464	(64)
										Total per year (kWh/year) = Sum(64)m =		2144.1696	(64)
12Total per year (kWh/year)												2144	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	74.4700	65.8249	69.8096	61.0502	58.9664	52.8027	51.7201	54.2013	54.9315	61.5397	65.7927	73.6102	(65)

---

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	95.9478	106.2279	95.9478	99.1460	95.9478	99.1460	95.9478	95.9478	99.1460	95.9478	99.1460	95.9478	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	173.0226	174.8180	170.2936	160.6616	148.5030	137.0755	129.4413	127.6459	132.1703	141.8023	153.9610	165.3884	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	(71)
Water heating gains (Table 5)													
	100.0941	97.9537	93.8301	84.7919	79.2559	73.3371	69.5163	72.8512	76.2938	82.7146	91.3788	98.9384	(72)
Total internal gains													
	424.8017	434.7368	415.8087	400.3368	379.4438	362.2959	347.6427	349.1821	360.3474	376.2020	400.2230	416.0118	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.7600	36.7938	0.6300	0.7000	0.7700	42.2800	(77)
Southwest	3.7600	36.7938	0.6300	0.7000	0.7700	42.2800	(79)

Solar gains	84.5599	144.0369	197.0775	244.1886	273.5116	271.5337	261.7875	239.9112	213.3933	159.1914	101.2833	72.3657 (83)
Total gains	509.3616	578.7737	612.8863	644.5254	652.9554	633.8296	609.4301	589.0933	573.7407	535.3934	501.5064	488.3775 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.5319	61.6606	61.7872	62.3891	62.5030	63.0388	63.0388	63.1390	62.8313	62.5030	62.2730	62.0343	
alpha	5.1021	5.1107	5.1191	5.1593	5.1669	5.2026	5.2026	5.2093	5.1888	5.1669	5.1515	5.1356	
util living area	0.9906	0.9810	0.9638	0.9163	0.8156	0.6382	0.4721	0.5075	0.7315	0.9249	0.9805	0.9923	(86)
MIT	19.8762	20.0662	20.3046	20.6082	20.8422	20.9663	20.9941	20.9915	20.9314	20.6431	20.2114	19.8429	(87)
Th 2	19.9776	19.9795	19.9813	19.9902	19.9918	19.9995	19.9995	20.0009	19.9965	19.9918	19.9885	19.9850	(88)
util rest of house	0.9876	0.9753	0.9525	0.8900	0.7612	0.5506	0.3676	0.4015	0.6491	0.8959	0.9735	0.9899	(89)
MIT 2	18.6914	18.9323	19.2313	19.6040	19.8626	19.9808	19.9977	19.9980	19.9530	19.6532	19.1246	18.6547	(90)
Living area fraction									fLA = Living area / (4) =			0.4874	(91)
MIT	19.2689	19.4850	19.7544	20.0935	20.3401	20.4611	20.4834	20.4822	20.4299	20.1357	19.6544	19.2338	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2689	19.4850	19.7544	20.0935	20.3401	20.4611	20.4834	20.4822	20.4299	20.1357	19.6544	19.2338	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9849	0.9718	0.9495	0.8931	0.7814	0.5922	0.4187	0.4533	0.6865	0.9007	0.9706	0.9875	(94)
Useful gains	501.6936	562.4436	581.9460	575.6105	510.2014	375.3613	255.1409	267.0215	393.8938	482.2159	486.7391	482.2723	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1014.1349	986.0598	894.2691	747.9334	576.2670	387.5954	256.8058	269.5301	419.9796	636.0001	840.4286	1010.2847	(97)
Space heating kWh	381.2564	284.6701	232.3683	124.0725	49.1528	0.0000	0.0000	0.0000	0.0000	114.4154	254.6564	392.8412	(98a)
Space heating requirement - total per year (kWh/year)												1833.4331	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	381.2564	284.6701	232.3683	124.0725	49.1528	0.0000	0.0000	0.0000	0.0000	114.4154	254.6564	392.8412	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1833.4331	
Space heating per m2										(98c) / (4) =		30.5419	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	381.2564	284.6701	232.3683	124.0725	49.1528	0.0000	0.0000	0.0000	0.0000	114.4154	254.6564	392.8412	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	412.6151	308.0845	251.4809	134.2776	53.1957	0.0000	0.0000	0.0000	0.0000	123.8262	275.6022	425.1528	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	210.3459	186.1582	198.2709	175.7020	171.2133	154.8824	152.8412	159.6430	160.8230	178.1318	187.9114	208.2464	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.6389	85.2885	84.7224	83.6492	82.0709	80.3000	80.3000	80.3000	80.3000	83.4576	85.0333	85.7195	(217)
Fuel for water heating, kWh/month	245.6194	218.2690	234.0241	210.0463	208.6164	192.8797	190.3378	198.8082	200.2777	213.4400	220.9858	242.9395	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9361	15.9934	14.4003	10.5503	8.1493	6.6581	7.4341	9.6631	12.5515	16.4682	18.6008	20.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.5668	-30.0036	-44.6109	-51.9478	-57.5806	-54.3346	-53.6972	-49.9415	-43.5446	-35.1353	-22.9769	-17.6675	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.7317	-18.6416	-37.5580	-57.1473	-76.2732	-76.8776	-75.9453	-63.9510	-46.4320	-26.8692	-11.7276	-6.8824	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1984.2350	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2576.2439	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.8954	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-989.0444	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3818.3299	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1984.2350	0.2100	416.6893	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2576.2439	0.2100	541.0112	(264)
Space and water heating			957.7006	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8954	0.1443	23.2222	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-482.0073	0.1339	-64.5218	
PV Unit electricity exported	-507.0371	0.1255	-63.6455	
Total			-128.1672	(269)
Total CO2, kg/year			864.6848	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1984.2350	1.1300	2242.1855	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2576.2439	1.1300	2911.1556	(278)
Space and water heating			5153.3411	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8954	1.5338	246.7867	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-482.0073	1.4947	-720.4490	
PV Unit electricity exported	-507.0371	0.4607	-233.6140	
Total			-954.0630	(283)
Total Primary energy kWh/year			4576.1656	(286)
Target Primary Energy Rate (TPER)			76.2300	(287)

Full SAP Calculation Printout

Property Reference	FLAT 7	**Issued on Date**	17/06/2025
Assessment Reference	Flat 7	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	13.42	**TER**	15.47
Environmental	91 B	**% DER < TER**			13.25
CO_2 Emissions (t/year)	0.61	**DFEE**	34.66	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			6.44
% DPER < TPER	-4.05	**DPER**	85.36	**TPER**	82.04

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.5660	(5)

---

2. Ventilation rate

---

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
GLAZING			9.9000	0.8687	8.6004			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	52.2900	12.5400	39.7500	0.1200	4.7700	135.0000	5366.2501	(29a)
EXPOSED EXT. WALL	11.7000	2.2000	9.5000	0.1200	1.1400	135.0000	1282.5000	(29a)
Total net area of external elements Aum(A, m2)			63.9900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.8664			(33)
Main dwelling								
Party Wall 1			18.6300	0.0000	0.0000	180.0000	3353.3998	(32)
Party Floor 1			50.5800			40.0000	2023.2000	(32d)
Party Ceiling 1			50.5800			30.0000	1517.4000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13542.7499	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	267.7491	(35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	36.2000	0.0700	2.5340	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.2000	0.0800	0.8960	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E16 Corner (normal)	8.1000	0.0900	0.7290	
E18 Party wall between dwellings	2.7000	0.0600	0.1620	
P8 Party Wall - Exposed floor (inverted)	6.9000	0.2400	1.6560	
E2 Other lintels (including other steel lintels)	7.1000	0.2000	1.4200	
E3 Sill	4.9000	0.0400	0.1960	
E4 Jamb	29.2000	0.0500	1.4600	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.8100	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	27.6764	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9144	12.7708	12.6271	11.9089	11.7652	11.0470	11.0470	10.9033	11.3343	11.7652	12.0525	12.3398	(38)
Heat transfer coeff	40.5908	40.4472	40.3035	39.5853	39.4416	38.7234	38.7234	38.5797	39.0107	39.4416	39.7289	40.0162	(39)
Average = Sum(39)m / 12 =												39.5494	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8025	0.7997	0.7968	0.7826	0.7798	0.7656	0.7656	0.7627	0.7713	0.7798	0.7855	0.7911	(40)
HLP (average)												0.7819	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7072	(42)
Hot water usage for mixer showers	52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)
Hot water usage for baths	22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)
Hot water usage for other uses	32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)
Average daily hot water use (litres/day)												99.0971	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(64)
										Total per year (kWh/year) = Sum(64)m =		2245.9825	(64)
12Total per year (kWh/year)												2246	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.5094	61.4600	65.2237	57.1351	55.2518	49.6380	48.8605	50.8695	51.5080	57.6181	61.4964	68.7186	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.7321	83.8463	75.7321	78.2566	75.7321	78.2566	75.7321	75.7321	78.2566	75.7321	78.2566	75.7321	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	93.4266	91.4583	87.6663	79.3543	74.2632	68.9416	65.6728	68.3730	71.5389	77.4437	85.4117	92.3638	(72)
Total internal gains	369.5068	377.1962	361.4005	347.3327	329.2649	313.6441	301.2880	302.4447	312.0245	326.6852	347.6298	361.8811	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.7400	36.7938	0.3000	0.8000	0.7700	22.8871	(79)
Northwest	6.1600	11.2829	0.3000	0.8000	0.7700	11.5597	(81)

Solar gains	34.4468	62.5154	95.7351	135.7153	167.6159	173.2672	164.1918	139.3433	109.4149	71.8427	41.9586	29.0269	(83)
Total gains	403.9536	439.7115	457.1356	483.0480	496.8808	486.9112	465.4798	441.7880	421.4394	398.5279	389.5884	390.9080	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.6779	93.0071	93.3386	95.0322	95.3783	97.1474	97.1474	97.5091	96.4319	95.3783	94.6885	94.0087	
alpha	7.1785	7.2005	7.2226	7.3355	7.3586	7.4765	7.4765	7.5006	7.4288	7.3586	7.3126	7.2672	
util living area													
	0.9900	0.9800	0.9574	0.8763	0.7157	0.5074	0.3659	0.4014	0.6303	0.8927	0.9757	0.9918	(86)
MIT	20.4067	20.5295	20.6864	20.8807	20.9760	20.9983	20.9999	20.9998	20.9924	20.8833	20.6314	20.3912	(87)
Th 2	20.2512	20.2536	20.2561	20.2684	20.2709	20.2833	20.2833	20.2857	20.2783	20.2709	20.2659	20.2610	(88)
util rest of house													
	0.9870	0.9742	0.9452	0.8467	0.6670	0.4513	0.3064	0.3393	0.5680	0.8602	0.9676	0.9893	(89)
MIT 2	19.5697	19.7256	19.9207	20.1556	20.2527	20.2824	20.2832	20.2857	20.2738	20.1646	19.8645	19.5583	(90)
Living area fraction										fLA = Living area / (4) =		0.5061	(91)
MIT	19.9933	20.1325	20.3083	20.5226	20.6188	20.6447	20.6459	20.6471	20.6375	20.5284	20.2527	19.9799	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8433	19.9825	20.1583	20.3726	20.4688	20.4947	20.4959	20.4971	20.4875	20.3784	20.1027	19.8299	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9716	0.9434	0.8512	0.6806	0.4679	0.3241	0.3577	0.5863	0.8654	0.9655	0.9874	(94)
Useful gains	397.8760	427.2397	431.2648	411.1637	338.1768	227.8428	150.8415	158.0187	247.1013	344.9024	376.1311	385.9906	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	630.9175	610.0447	550.4760	454.1446	345.8559	228.2641	150.8639	158.0643	249.1798	385.6752	516.5823	625.4498	(97)
Space heating kWh													
	173.3829	122.8450	88.6932	30.9462	5.7133	0.0000	0.0000	0.0000	0.0000	30.3350	101.1249	178.1577	(98a)
Space heating requirement - total per year (kWh/year)												731.1980	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	173.3829	122.8450	88.6932	30.9462	5.7133	0.0000	0.0000	0.0000	0.0000	30.3350	101.1249	178.1577	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												731.1980	
Space heating per m2											(98c) / (4) =	14.4563	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	173.3829	122.8450	88.6932	30.9462	5.7133	0.0000	0.0000	0.0000	0.0000	30.3350	101.1249	178.1577	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	193.7239	137.2570	99.0985	34.5768	6.3835	0.0000	0.0000	0.0000	0.0000	33.8938	112.9887	199.0588	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	190.7662	167.8604	176.3649	150.5653	142.8558	125.3722	121.3788	128.1296	131.6561	150.8074	165.2207	188.1091	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	62.9597	56.8668	62.9597	60.9287	62.9597	60.9287	62.9597	62.9597	60.9287	62.9597	60.9287	62.9597	(231)
Lighting	15.7356	12.6237	11.3663	8.3274	6.4323	5.2553	5.8678	7.6272	9.9069	12.9984	14.6817	16.1730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												816.9810	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												1839.0866	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)													
mechanical ventilation fans (SFP = 0.6020)												100.2995	(230a)
central heating pump												41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler												600.0000	(230f)
Total electricity for the above, kWh/year												741.2995	(231)
Electricity for lighting (calculated in Appendix L)												126.9957	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3524.3628	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	816.9810	0.2100	171.5660	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1839.0866	0.2100	386.2082	(264)
Space and water heating			557.7742	(265)
Pumps, fans and electric keep-hot	741.2995	0.1387	102.8274	(267)
Energy for lighting	126.9957	0.1443	18.3294	(268)
Total CO2, kg/year			678.9310	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.4200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	816.9810	1.1300	923.1885	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1839.0866	1.1300	2078.1678	(278)
Space and water heating			3001.3563	(279)
Pumps, fans and electric keep-hot	741.2995	1.5128	1121.4379	(281)
Energy for lighting	126.9957	1.5338	194.7902	(282)
Total Primary energy kWh/year			4317.5845	(286)
Dwelling Primary energy Rate (DPER)			85.3600	(287)

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

---

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.5660	(5)

---

2. Ventilation rate

---

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1464	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3964	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3370	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4297	0.4212	0.4128	0.3707	0.3623	0.3201	0.3201	0.3117	0.3370	0.3623	0.3791	0.3960	(22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5568	0.5656	0.5719	0.5784	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)

TER Opening Type			7.8000	1.1450	8.9313		(27)
External Wall 1	52.2900	10.4400	41.8500	0.1800	7.5330		(29a)
EXPOSED EXT. WALL	11.7000	2.2000	9.5000	0.1800	1.7100		(29a)
Total net area of external elements Aum(A, m2)			63.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0143		(33)
Main dwelling							
Party Wall 1			18.6300	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 277.7491 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	36.2000	0.0700	2.5340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.2000	0.0200	0.2240
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E16 Corner (normal)	8.1000	0.0900	0.7290
E18 Party wall between dwellings	2.7000	0.0600	0.1620
P8 Party Wall - Exposed floor (inverted)	6.9000	0.2400	1.6560
E2 Other lintels (including other steel lintels)	7.1000	0.0500	0.3550
E3 Sill	4.9000	0.0500	0.2450
E4 Jamb	29.2000	0.0500	1.4600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.1220 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.1363 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.6931	26.5315	26.3732	25.6296	25.4904	24.8427	24.8427	24.7228	25.0922	25.4904	25.7719	26.0662	(38)
Heat transfer coeff	56.8294	56.6678	56.5095	55.7659	55.6267	54.9790	54.9790	54.8591	55.2285	55.6267	55.9082	56.2025	(39)
Average = Sum(39)m / 12 =												55.7652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1236	1.1204	1.1172	1.1025	1.0998	1.0870	1.0870	1.0846	1.0919	1.0998	1.1053	1.1112	(40)
HLP (average)												1.1025	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)

Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.5445	48.3987	45.0023	45.7732	47.1953	47.1244	50.6861	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	221.6946	196.2625	208.8055	183.3004	176.2547	157.2104	154.4072	161.8713	164.9566	185.6587	197.1876	219.3165	(62)
WWHRS	-24.1578	-21.3654	-22.3726	-18.5254	-17.2650	-14.7738	-13.8481	-14.7260	-15.2855	-18.0199	-20.4144	-23.7104	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.5368	174.8971	186.4329	164.7750	158.9897	142.4366	140.5591	147.1453	149.6711	167.6388	176.7732	195.6061	(64)
										Total per year (kWh/year) = Sum(64)m =		2002.4619	(64)
12Total per year (kWh/year)												2002	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.5094	61.4600	65.2237	56.9425	54.6118	48.5598	47.5641	49.9286	50.9603	57.5499	61.4964	68.7186	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8520	87.3004	78.8520	81.4804	78.8520	81.4804	78.8520	78.8520	81.4804	78.8520	81.4804	78.8520	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	93.4266	91.4583	87.6663	79.0868	73.4029	67.4441	63.9302	67.1083	70.7782	77.3521	85.4117	92.3638	(72)
Total internal gains	372.6266	380.6503	364.5203	350.2890	331.5245	315.3704	302.6653	304.2999	314.4877	329.7133	350.8536	365.0010	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Southwest					2.9400	36.7938		0.6300	0.7000	0.7700		33.0593	(79)
Northwest					4.8600	11.2829		0.6300	0.7000	0.7700		16.7583	(81)
Solar gains	49.8177	90.4243	138.5080	196.4008	242.6057	250.8013	237.6585	201.6664	158.3165	103.9247	60.6838	41.9776	(83)
Total gains	422.4442	471.0746	503.0283	546.6897	574.1302	566.1717	540.3238	505.9663	472.8042	433.6380	411.5374	406.9786	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6683	68.8640	69.0569	69.9778	70.1529	70.9793	70.9793	71.1345	70.6587	70.1529	69.7997	69.4342	
alpha	5.5779	5.5909	5.6038	5.6652	5.6769	5.7320	5.7320	5.7423	5.7106	5.6769	5.6533	5.6289	
util living area	0.9939	0.9878	0.9739	0.9236	0.8026	0.6054	0.4452	0.4941	0.7463	0.9429	0.9869	0.9950	(86)
MIT	19.9644	20.1247	20.3545	20.6664	20.8889	20.9821	20.9974	20.9954	20.9445	20.6667	20.2717	19.9424	(87)
Th 2	19.9816	19.9842	19.9868	19.9988	20.0010	20.0115	20.0115	20.0134	20.0075	20.0010	19.9965	19.9917	(88)
util rest of house	0.9918	0.9836	0.9646	0.8973	0.7446	0.5192	0.3466	0.3907	0.6620	0.9173	0.9815	0.9932	(89)
MIT 2	18.7958	19.0007	19.2906	19.6752	19.9147	20.0024	20.0108	20.0120	19.9740	19.6855	19.1977	18.7755	(90)
Living area fraction									fLA = Living area / (4) =			0.5061	(91)
MIT	19.3872	19.5696	19.8291	20.1769	20.4078	20.4983	20.5101	20.5097	20.4652	20.1821	19.7413	19.3661	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3872	19.5696	19.8291	20.1769	20.4078	20.4983	20.5101	20.5097	20.4652	20.1821	19.7413	19.3661	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9901	0.9815	0.9628	0.9026	0.7696	0.5625	0.3966	0.4432	0.7029	0.9227	0.9798	0.9918	(94)
Useful gains	418.2711	462.3405	484.3330	493.4349	441.8695	318.4655	214.3154	224.2454	332.3108	400.1311	403.2272	403.6388	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	857.3980	831.2951	753.2193	628.8670	484.3850	324.2816	214.9741	225.4556	351.5400	533.0201	706.7533	852.3726	(97)
Space heating kWh	326.7104	247.9375	200.0514	97.5111	31.6315	0.0000	0.0000	0.0000	0.0000	98.8694	218.5388	333.8580	(98a)
Space heating requirement - total per year (kWh/year)												1555.1080	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	326.7104	247.9375	200.0514	97.5111	31.6315	0.0000	0.0000	0.0000	0.0000	98.8694	218.5388	333.8580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1555.1080	
Space heating per m2											(98c) / (4) =	30.7455	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	326.7104	247.9375	200.0514	97.5111	31.6315	0.0000	0.0000	0.0000	0.0000	98.8694	218.5388	333.8580	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	353.5827	268.3306	216.5058	105.5315	34.2332	0.0000	0.0000	0.0000	0.0000	107.0015	236.5139	361.3181	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	197.5368	174.8971	186.4329	164.7750	158.9897	142.4366	140.5591	147.1453	149.6711	167.6388	176.7732	195.6061	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.4516	85.1289	84.5328	83.2957	81.6101	80.3000	80.3000	80.3000	80.3000	83.2891	84.8370	85.5164	(217)
Fuel for water heating, kWh/month	231.1680	205.4498	220.5450	197.8194	194.8163	177.3806	175.0425	183.2444	186.3899	201.2735	208.3680	228.7351	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.3839	13.1438	11.8345	8.6705	6.6973	5.4718	6.1095	7.9414	10.3151	13.5339	15.2865	16.8392	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.4212	-25.4665	-37.9498	-44.3059	-49.2256	-46.5090	-45.9744	-42.7044	-37.1490	-29.8789	-19.4841	-14.9603	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.2652	-15.5209	-31.2839	-47.6153	-63.5567	-64.0476	-63.2597	-53.2590	-38.6634	-22.3648	-9.7571	-5.7249	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1683.0173	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	

Water heating fuel used	2410.2327	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	132.2273	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-833.3478	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3478.1295	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.0173	0.2100	353.4336	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2410.2327	0.2100	506.1489	(264)
Space and water heating			859.5825	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2273	0.1443	19.0845	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-411.0292	0.1338	-54.9976	
PV Unit electricity exported	-422.3186	0.1255	-53.0097	
Total			-108.0073	(269)
Total CO2, kg/year			782.5889	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.4700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.0173	1.1300	1901.8095	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2410.2327	1.1300	2723.5629	(278)
Space and water heating			4625.3725	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2273	1.5338	202.8147	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-411.0292	1.4945	-614.2728	
PV Unit electricity exported	-422.3186	0.4607	-194.5750	
Total			-808.8479	(283)
Total Primary energy kWh/year			4149.4401	(286)
Target Primary Energy Rate (TPER)			82.0400	(287)

Full SAP Calculation Printout

Property Reference	flat 8	**Issued on Date**	17/06/2025
Assessment Reference	Flat 8	**Prop Type Ref**	
Property			

SAP Rating	82 B	**DER**	11.90	**TER**	9.04
Environmental	90 B	**% DER < TER**			-31.64
CO_2 Emissions (t/year)	0.81	**DFEE**	36.31	**TFEE**	37.57
Compliance Check	See BREL	**% DFEE < TFEE**			3.35
% DPER < TPER	-51.84	**DPER**	73.64	**TPER**	48.50

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.6900	(1b)	x 2.7000	(2b) =	209.7630	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.6900					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.7630	(5)

---

2. Ventilation rate

---

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			15.4000	0.8687	13.3784			(27)
OPAQUE			5.2800	0.9000	4.7520			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
explosed ext floor			5.7400	0.0900	0.5166			(28b)
exposed floor			18.2300	0.0900	1.6407			(28b)
External Wall 1	58.0000	20.6800	37.3200	0.1200	4.4784			(29a)
Exposed internal wall	11.4800	2.2000	9.2800	0.1200	1.1136			(29a)
Total net area of external elements Aum(A, m2)			93.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8597			(33)
Main dwelling								
Party Wall 1			35.5700	0.0000	0.0000			(32)
Party Floor 1			53.7200					(32d)
Party Ceiling 1			77.6900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	18.2800	0.0000	0.0000
E7	Party floor between dwellings (in blocks of flats)	28.1700	0.0700	1.9719
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	15.8600	0.0800	1.2688
E16	Corner (normal)	10.8000	0.0900	0.9720
E17	Corner (inverted - internal area greater than external area)	8.1000	-0.0900	-0.7290
E18	Party wall between dwellings	5.4000	0.0600	0.3240
E25	Staggered party wall between dwellings	5.4000	0.0800	0.4320
P8	Party Wall - Exposed floor (inverted)	19.2800	0.2400	4.6272
E20	Exposed floor (normal)	7.4000	0.3200	2.3680
E2	Other lintels (including other steel lintels)	10.4000	0.2000	2.0800
E3	Sill	7.0000	0.0400	0.2800
E4	Jamb	44.0000	0.0500	2.2000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.7949 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.6546 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8364	19.6157	19.3951	18.2919	18.0712	16.9680	16.9680	16.7473	17.4093	18.0712	18.5125	18.9538	(38)
Heat transfer coeff	63.4909	63.2703	63.0497	61.9464	61.7258	60.6226	60.6226	60.4019	61.0639	61.7258	62.1671	62.6084	(39)
Average = Sum(39)m / 12 =												61.8913	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8172	0.8144	0.8116	0.7974	0.7945	0.7803	0.7803	0.7775	0.7860	0.7945	0.8002	0.8059	(40)
HLP (average)												0.7966	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4176 (42)
Hot water usage for mixer showers

64.7544	63.7813	62.3632	59.6500	57.6478	55.4149	54.1457	55.5530	57.0957	59.4931	62.2646	64.5063	(42a)

Hot water usage for baths

27.9697	27.5543	26.9694	25.8908	25.0832	24.1877	23.7040	24.2849	24.9173	25.8755	26.9763	27.8752	(42b)

Hot water usage for other uses

39.3883	37.9560	36.5237	35.0914	33.6591	32.2268	32.2268	33.6591	35.0914	36.5237	37.9560	39.3883	(42c)

Average daily hot water use (litres/day) 121.4413 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.1124	129.2916	125.8563	120.6323	116.3901	111.8294	110.0765	113.4970	117.1044	121.8924	127.1969	131.7698	(44)
Energy conte	209.2338	184.1095	193.4365	165.1396	156.6835	137.5073	133.1280	140.5330	144.4015	165.4069	181.2153	206.3196	(45)
Energy content (annual)										Total = Sum(45)m =		2017.1144	
Distribution loss (46)m = 0.15 x (45)m	31.3851	27.6164	29.0155	24.7709	23.5025	20.6261	19.9692	21.0799	21.6602	24.8110	27.1823	30.9479	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	260.1927	230.1369	244.3954	214.4546	207.6424	186.8224	184.0869	191.4919	193.7165	216.3658	230.5304	257.2785	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	260.1927	230.1369	244.3954	214.4546	207.6424	186.8224	184.0869	191.4919	193.7165	216.3658	230.5304	257.2785	(64)
										Total per year (kWh/year) = Sum(64)m =		2617.1144	(64)
12Total per year (kWh/year)												2617	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	82.3100	72.7233	77.0573	67.2377	64.8370	58.0499	57.0048	59.4669	60.3423	67.7375	72.5829	81.3410	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.0798	120.7669	109.0798	112.7158	109.0798	112.7158	109.0798	109.0798	112.7158	109.0798	112.7158	109.0798	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.5450	216.7713	211.1611	199.2176	184.1411	169.9713	160.5050	158.2787	163.8889	175.8324	190.9089	205.0787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	(71)
Water heating gains (Table 5)	110.6317	108.2191	103.5717	93.3857	87.1465	80.6249	76.6193	79.9287	83.8087	91.0450	100.8095	109.3293	(72)
Total internal gains	496.5200	508.0209	486.0761	467.5826	442.6309	422.5756	405.4677	406.5507	419.6769	438.2208	466.6978	485.7514	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(79)
Northwest	6.1600	11.2829	0.3000	0.8000	0.7700	11.5597	(81)

Solar gains	68.1044	119.8466	174.1782	232.9101	276.4821	281.3462	268.3915	234.8355	194.3522	135.2059	82.2726	57.8307	(83)

Total gains	564.6244	627.8675	660.2544	700.4927	719.1130	703.9217	673.8592	641.3862	614.0291	573.4267	548.9704	543.5820	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.9749	85.2713	85.5697	87.0936	87.4049	88.9956	88.9956	89.3206	88.3524	87.4049	86.7845	86.1728	
alpha	6.6650	6.6848	6.7046	6.8062	6.8270	6.9330	6.9330	6.9547	6.8902	6.8270	6.7856	6.7449	
util living area													
	0.9929	0.9845	0.9659	0.8994	0.7565	0.5472	0.3955	0.4325	0.6692	0.9158	0.9827	0.9943	(86)
MIT	20.2661	20.4114	20.5934	20.8238	20.9557	20.9958	20.9996	20.9993	20.9846	20.8277	20.5216	20.2473	(87)
Th 2	20.2384	20.2409	20.2433	20.2556	20.2581	20.2704	20.2704	20.2729	20.2655	20.2581	20.2532	20.2482	(88)
util rest of house													
	0.9908	0.9801	0.9561	0.8737	0.7085	0.4866	0.3301	0.3645	0.6048	0.8885	0.9770	0.9927	(89)
MIT 2	19.3856	19.5709	19.7995	20.0827	20.2226	20.2681	20.2703	20.2726	20.2558	20.0941	19.7211	19.3696	(90)
Living area fraction										fLA = Living area / (4) =		0.4082	(91)
MIT	19.7450	19.9140	20.1236	20.3852	20.5218	20.5651	20.5680	20.5692	20.5533	20.3935	20.0478	19.7278	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5950	19.7640	19.9736	20.2352	20.3718	20.4151	20.4180	20.4192	20.4033	20.2435	19.8978	19.5778	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9885	0.9766	0.9520	0.8729	0.7162	0.4987	0.3433	0.3782	0.6172	0.8879	0.9735	0.9907	(94)
Useful gains	558.1564	613.1965	628.5603	611.4876	515.0350	351.0655	231.3634	242.5942	379.0044	509.1603	534.4400	538.5135	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	971.0917	940.4488	849.5029	702.1729	535.2754	352.5279	231.4555	242.7698	384.9021	595.2526	795.6025	962.7808	(97)
Space heating kWh													
	307.2239	219.9136	164.3813	65.2934	15.0589	0.0000	0.0000	0.0000	0.0000	64.0526	188.0370	315.6548	(98a)
Space heating requirement - total per year (kWh/year)												1339.6155	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	307.2239	219.9136	164.3813	65.2934	15.0589	0.0000	0.0000	0.0000	0.0000	64.0526	188.0370	315.6548	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1339.6155	
Space heating per m2											(98c) / (4) =	17.2431	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	307.2239	219.9136	164.3813	65.2934	15.0589	0.0000	0.0000	0.0000	0.0000	64.0526	188.0370	315.6548	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	343.2669	245.7135	183.6663	72.9535	16.8256	0.0000	0.0000	0.0000	0.0000	71.5672	210.0972	352.6870	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	260.1927	230.1369	244.3954	214.4546	207.6424	186.8224	184.0869	191.4919	193.7165	216.3658	230.5304	257.2785	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	233.7808	205.7090	216.1301	184.5135	175.0653	153.6394	148.7464	157.0201	161.3424	184.8121	202.4752	230.5247	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	67.5255	60.9908	67.5255	65.3473	67.5255	65.3473	67.5255	67.5255	65.3473	67.5255	65.3473	67.5255	(231)
Lighting	22.6646	18.1824	16.3712	11.9943	9.2647	7.5694	8.4516	10.9857	14.2693	18.7221	21.1466	23.2945	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1496.7771	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2253.7592	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	154.0583	(230a)
central heating pump	41.0000	(230c)

maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	795.0583	(231)
Electricity for lighting (calculated in Appendix L)	182.9165	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4728.5111	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1496.7771	0.2100	314.3232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2253.7592	0.2100	473.2894	(264)
Space and water heating			787.6126	(265)
Pumps, fans and electric keep-hot	795.0583	0.1387	110.2844	(267)
Energy for lighting	182.9165	0.1443	26.4005	(268)
Total CO2, kg/year			924.2975	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.9000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1496.7771	1.1300	1691.3581	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2253.7592	1.1300	2546.7478	(278)
Space and water heating			4238.1060	(279)
Pumps, fans and electric keep-hot	795.0583	1.5128	1202.7643	(281)
Energy for lighting	182.9165	1.5338	280.5635	(282)
Total Primary energy kWh/year			5721.4337	(286)
Dwelling Primary energy Rate (DPER)			73.6400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.6900	(1b)	x 2.7000	(2b) =	209.7630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.6900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.7630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1430	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3930	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3341	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4259	0.4176	0.4092	0.3675	0.3591	0.3174	0.3174	0.3090	0.3341	0.3591	0.3758	0.3925	(22b)
Effective ac	0.5907	0.5872	0.5837	0.5675	0.5645	0.5504	0.5504	0.5477	0.5558	0.5645	0.5706	0.5770	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			7.4800	1.0000	7.4800			(26)
TER Opening Type			11.9500	1.1450	13.6832			(27)
explosed ext floor			5.7400	0.1300	0.7462			(28b)
exposed floor			18.2300	0.1300	2.3699			(28b)
External Wall 1	58.0000	17.2300	40.7700	0.1800	7.3386			(29a)
Exposed internal wall	11.4800	2.2000	9.2800	0.1800	1.6704			(29a)
Total net area of external elements Aum(A, m2)			93.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.2883			(33)
Main dwelling								
Party Wall 1			35.5700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.2800	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	28.1700	0.0700	1.9719
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.8600	0.0200	0.3172
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	8.1000	-0.0900	-0.7290
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
P8 Party Wall - Exposed floor (inverted)	19.2800	0.2400	4.6272
E20 Exposed floor (normal)	7.4000	0.3200	2.3680
E2 Other lintels (including other steel lintels)	10.4000	0.0500	0.5200
E3 Sill	7.0000	0.0500	0.3500
E4 Jamb	44.0000	0.0500	2.2000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2453 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.5336 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8900	40.6462	40.4072	39.2846	39.0746	38.0969	38.0969	37.9158	38.4735	39.0746	39.4995	39.9437	(38)
Heat transfer coeff	87.4236	87.1798	86.9408	85.8182	85.6082	84.6305	84.6305	84.4494	85.0071	85.6082	86.0331	86.4773	(39)
Average = Sum(39)m / 12 =												85.8172	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1253	1.1221	1.1191	1.1046	1.1019	1.0893	1.0893	1.0870	1.0942	1.1019	1.1074	1.1131	(40)
HLP (average)												1.1046	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4176 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	64.7544	63.7813	62.3632	59.6500	57.6478	55.4149	54.1457	55.5530	57.0957	59.4931	62.2646	64.5063	(42a)
Hot water usage for baths	27.9697	27.5543	26.9694	25.8908	25.0832	24.1877	23.7040	24.2849	24.9173	25.8755	26.9763	27.8752	(42b)
Hot water usage for other uses	39.3883	37.9560	36.5237	35.0914	33.6591	32.2268	32.2268	33.6591	35.0914	36.5237	37.9560	39.3883	(42c)
Average daily hot water use (litres/day)												121.4413	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.1124	129.2916	125.8563	120.6323	116.3901	111.8294	110.0765	113.4970	117.1044	121.8924	127.1969	131.7698	(44)
Energy conte	209.2338	184.1095	193.4365	165.1396	156.6835	137.5073	133.1280	140.5330	144.4015	165.4069	181.2153	206.3196	(45)
Energy content (annual)										Total = Sum(45)m =		2017.1144	
Distribution loss (46)m = 0.15 x (45)m	31.3851	27.6164	29.0155	24.7709	23.5025	20.6261	19.9692	21.0799	21.6602	24.8110	27.1823	30.9479	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	260.1927	230.1369	244.3954	214.4546	207.6424	186.8224	184.0869	191.4919	193.7165	216.3658	230.5304	257.2785	(62)
WWHRS	-29.6030	-26.1811	-27.4154	-22.7010	-21.1565	-18.1038	-16.9694	-18.0453	-18.7309	-22.0816	-25.0158	-29.0548	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	230.5897	203.9558	216.9800	191.7536	186.4858	168.7186	167.1175	173.4466	174.9857	194.2841	205.5146	228.2237	(64)
										Total per year (kWh/year) = Sum(64)m =		2342.0558	(64)
12Total per year (kWh/year)												2342	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	82.3100	72.7233	77.0573	67.2377	64.8370	58.0499	57.0048	59.4669	60.3423	67.7375	72.5829	81.3410	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.7970	125.9895	113.7970	117.5902	113.7970	117.5902	113.7970	113.7970	117.5902	113.7970	117.5902	113.7970	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.5450	216.7713	211.1611	199.2176	184.1411	169.9713	160.5050	158.2787	163.8889	175.8324	190.9089	205.0787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	(71)
Water heating gains (Table 5)	110.6317	108.2191	103.5717	93.3857	87.1465	80.6249	76.6193	79.9287	83.8087	91.0450	100.8095	109.3293	(72)
Total internal gains	501.2372	513.2435	490.7933	472.4570	447.3481	427.4500	410.1849	411.2679	424.5514	442.9380	471.5722	490.4686	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.1700	36.7938	0.6300	0.7000	0.7700	80.6243	(79)
Northwest	4.7800	11.2829	0.6300	0.7000	0.7700	16.4825	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	97.1068	170.8836	248.3524	332.0954	394.2227	401.1580	382.6866	334.8407	277.1175	192.7837	117.3085	82.4580	(83)
Total gains	598.3440	684.1271	739.1458	804.5524	841.5708	828.6080	792.8715	746.1087	701.6689	635.7216	588.8808	572.9266	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.7126	61.8852	62.0553	62.8671	63.0213	63.7494	63.7494	63.8860	63.4669	63.0213	62.7101	62.3879	
alpha	5.1142	5.1257	5.1370	5.1911	5.2014	5.2500	5.2500	5.2591	5.2311	5.2014	5.1807	5.1592	
util living area	0.9938	0.9870	0.9723	0.9246	0.8146	0.6275	0.4649	0.5125	0.7561	0.9434	0.9869	0.9950	(86)
MIT	19.8006	19.9898	20.2480	20.5902	20.8460	20.9698	20.9947	20.9915	20.9219	20.5955	20.1452	19.7737	(87)
Th 2	19.9802	19.9828	19.9853	19.9971	19.9993	20.0096	20.0096	20.0115	20.0056	19.9993	19.9948	19.9901	(88)
util rest of house	0.9918	0.9828	0.9633	0.9002	0.7604	0.5413	0.3628	0.4066	0.6751	0.9198	0.9820	0.9934	(89)
MIT 2	18.5976	18.8394	19.1655	19.5899	19.8732	19.9929	20.0079	20.0085	19.9550	19.6064	19.0471	18.5706	(90)
Living area fraction										fLA = Living area / (4) =		0.4082	(91)
MIT	19.0886	19.3089	19.6073	19.9982	20.2703	20.3916	20.4107	20.4097	20.3496	20.0101	19.4953	19.0617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0886	19.3089	19.6073	19.9982	20.2703	20.3916	20.4107	20.4097	20.3496	20.0101	19.4953	19.0617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9895	0.9793	0.9591	0.9002	0.7762	0.5756	0.4046	0.4499	0.7050	0.9201	0.9788	0.9914	(94)
Useful gains	592.0376	669.9554	708.9250	724.2860	653.2622	476.9334	320.7941	335.6958	494.6997	584.9083	576.4002	567.9770	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1292.8768	1256.1683	1139.5598	952.4261	733.6873	490.1465	322.5015	338.6185	531.2629	805.5832	1066.4073	1285.1986	(97)
Space heating kWh	521.4243	393.9350	320.3923	164.2609	59.8363	0.0000	0.0000	0.0000	0.0000	164.1821	352.8051	533.6129	(98a)
Space heating requirement - total per year (kWh/year)												2510.4489	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	521.4243	393.9350	320.3923	164.2609	59.8363	0.0000	0.0000	0.0000	0.0000	164.1821	352.8051	533.6129	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2510.4489	
Space heating per m2											(98c) / (4) =	32.3137	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	521.4243	393.9350	320.3923	164.2609	59.8363	0.0000	0.0000	0.0000	0.0000	164.1821	352.8051	533.6129	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	564.3120	426.3366	346.7449	177.7715	64.7579	0.0000	0.0000	0.0000	0.0000	177.6863	381.8237	577.5031	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	230.5897	203.9558	216.9800	191.7536	186.4858	168.7186	167.1175	173.4466	174.9857	194.2841	205.5146	228.2237	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.0734	85.7666	85.2150	84.0515	82.2324	80.3000	80.3000	80.3000	80.3000	84.0228	85.5283	86.1364	(217)
Fuel for water heating, kWh/month	267.8990	237.8033	254.6267	228.1382	226.7790	210.1103	208.1164	215.9983	217.9149	231.2278	240.2885	264.9561	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.6448	18.9687	17.0792	12.5130	9.6654	7.8967	8.8171	11.4608	14.8864	19.5318	22.0611	24.3019	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-59.9502	-78.7693	-105.6201	-110.5514	-112.7629	-103.0567	-101.7699	-99.1057	-93.6563	-85.9649	-63.8278	-52.5344	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-53.8033	-110.0986	-213.4054	-313.0168	-406.9323	-406.3825	-401.5749	-343.0888	-255.6834	-154.7712	-70.9144	-42.7820	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

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

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

Annual totals kWh/year		
Space heating fuel - main system 1	2716.9360	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2803.8583	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	190.8268	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3840.0230	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1957.5982	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2716.9360	0.2100	570.5566	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2803.8583	0.2100	588.8102	(264)
Space and water heating			1159.3668	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	190.8268	0.1443	27.5422	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1067.5696	0.1361	-145.3099	
PV Unit electricity exported	-2772.4534	0.1266	-351.0208	
Total			-496.3307	(269)
Total CO2, kg/year			702.5076	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.0400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2716.9360	1.1300	3070.1377	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2803.8583	1.1300	3168.3599	(278)
Space and water heating			6238.4976	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	190.8268	1.5338	292.6966	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1067.5696	1.5031	-1604.6988	
PV Unit electricity exported	-2772.4534	0.4648	-1288.5755	
Total			-2893.2743	(283)
Total Primary energy kWh/year			3768.0207	(286)
Target Primary Energy Rate (TPER)			48.5000	(287)

Full SAP Calculation Printout

Property Reference	FLAT 9	**Issued on Date**	17/06/2025
Assessment Reference	Flat 9	**Prop Type Ref**	
Property			

SAP Rating	81 B	**DER**	11.53	**TER**	13.04
Environmental	92 A	**% DER < TER**			11.58
CO_2 Emissions (t/year)	0.56	**DFEE**	25.80	**TFEE**	26.91
Compliance Check	See BREL	**% DFEE < TFEE**			4.13
% DPER < TPER	-8.71	**DPER**	74.91	**TPER**	68.91

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.1500	11.0000	18.1500	0.1200	2.1780			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1200	2.1984			(29a)
Total net area of external elements Aum(A, m2)			49.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9949			(33)
Main dwelling								
Party Wall 1			33.5000	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	23.8000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	24.9900	0.0700	1.7493
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.8000	0.0800	0.9440
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E2 Other lintels (including other steel lintels)	6.4000	0.2000	1.2800
E3 Sill	3.8000	0.0400	0.1520
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4443 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 22.4392 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	35.1487	35.0130	34.8773	34.1989	34.0632	33.3848	33.3848	33.2491	33.6561	34.0632	34.3346	34.6060	(39)
Average = Sum(39)m / 12 =												34.1650	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6708	0.6682	0.6656	0.6527	0.6501	0.6371	0.6371	0.6345	0.6423	0.6501	0.6552	0.6604	(40)
HLP (average)												0.6520	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)
Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)											Total = Sum(45)m =	1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.0285	(64)
12Total per year (kWh/year)												2274	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.9762	50.2737	49.4760	51.5192	52.1756	58.3828	62.3342	69.6725	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	75.2368	69.8245	66.5000	69.2462	72.4661	78.4716	86.5753	93.6458	(72)
Total internal gains	381.4033	389.6512	373.1243	358.8210	340.1656	324.3111	311.5220	312.6757	322.6019	337.4572	359.0384	373.5512	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	432.5628	476.7946	492.3578	506.5570	505.6423	488.5911	469.9055	457.8239	451.7065	433.7693	420.3156	417.3330	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	103.5284	103.9296	104.3339	106.4037	106.8276	108.9985	108.9985	109.4433	108.1196	106.8276	105.9832	105.1521	
alpha	7.9019	7.9286	7.9556	8.0936	8.1218	8.2666	8.2666	8.2962	8.2080	8.1218	8.0655	8.0101	
util living area	0.9748	0.9473	0.8999	0.7823	0.6212	0.4370	0.3126	0.3340	0.5130	0.7824	0.9374	0.9791	(86)
MIT	20.6294	20.7488	20.8594	20.9606	20.9939	20.9997	21.0000	21.0000	20.9989	20.9665	20.8128	20.6120	(87)
Th 2	20.3667	20.3690	20.3713	20.3828	20.3852	20.3967	20.3967	20.3990	20.3921	20.3852	20.3805	20.3759	(88)
util rest of house	0.9686	0.9359	0.8804	0.7506	0.5819	0.3960	0.2697	0.2904	0.4683	0.7454	0.9223	0.9739	(89)
MIT 2	19.9476	20.0945	20.2264	20.3468	20.3806	20.3966	20.3967	20.3990	20.3914	20.3563	20.1835	19.9340	(90)
Living area fraction										fLA = Living area / (4) =		0.4752	(91)
MIT	20.2716	20.4054	20.5272	20.6385	20.6720	20.6832	20.6834	20.6846	20.6801	20.6463	20.4825	20.2562	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1216	20.2554	20.3772	20.4885	20.5220	20.5332	20.5334	20.5346	20.5301	20.4963	20.3325	20.1062	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9336	0.8806	0.7562	0.5908	0.4053	0.2794	0.3003	0.4785	0.7523	0.9210	0.9713	(94)
Useful gains	417.7849	445.1416	433.5623	383.0580	298.7104	198.0098	131.3124	137.4667	216.1437	326.3258	387.1248	405.3569	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	556.1075	537.6395	483.9997	396.3129	300.5067	198.0774	131.3149	137.4712	216.4125	337.0983	454.3331	550.4486	(97)
Space heating kWh	102.9120	62.1586	37.5254	9.5436	1.3365	0.0000	0.0000	0.0000	0.0000	8.0148	48.3899	107.9483	(98a)
Space heating requirement - total per year (kWh/year)												377.8291	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	102.9120	62.1586	37.5254	9.5436	1.3365	0.0000	0.0000	0.0000	0.0000	8.0148	48.3899	107.9483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												377.8291	
Space heating per m2											(98c) / (4) =	7.2105	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	102.9120	62.1586	37.5254	9.5436	1.3365	0.0000	0.0000	0.0000	0.0000	8.0148	48.3899	107.9483	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	114.9855	69.4510	41.9279	10.6632	1.4933	0.0000	0.0000	0.0000	0.0000	8.9551	54.0670	120.6126	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	194.0168	170.7206	179.3699	153.1307	145.2899	127.5083	123.4469	130.3128	133.8995	153.3771	168.0360	191.3144	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2662	57.1437	63.2662	61.2254	63.2662	61.2254	63.2662	63.2662	61.2254	63.2662	61.2254	63.2662	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 422.1554 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 1870.4229 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020) 103.9086 (230a)

central heating pump 41.0000 (230c)

maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)

Total electricity for the above, kWh/year 744.9086 (231)

Electricity for lighting (calculated in Appendix L) 135.4946 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3172.9815	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	422.1554	0.2100	88.6526	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.4229	0.2100	392.7888	(264)
Space and water heating			481.4415	(265)
Pumps, fans and electric keep-hot	744.9086	0.1387	103.3280	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Total CO2, kg/year			604.3255	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.5300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	422.1554	1.1300	477.0356	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.4229	1.1300	2113.5779	(278)
Space and water heating			2590.6136	(279)
Pumps, fans and electric keep-hot	744.9086	1.5128	1126.8977	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Total Primary energy kWh/year			3925.3374	(286)
Dwelling Primary energy Rate (DPER)			74.9100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3033	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2600	1.1450	9.4580			(27)

External Wall 1	29.1500	10.9000	18.2500	0.1800	3.2850		(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1800	3.2976		(29a)
Total net area of external elements Aum(A, m2)			49.6700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.8806		(33)
Main dwelling							
Party Wall 1			33.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	23.8000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	24.9900	0.0700	1.7493
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.8000	0.0200	0.2360
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E2 Other lintels (including other steel lintels)	6.4000	0.0500	0.3200
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.7063 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.5869 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff	52.4222	52.2866	52.1538	51.5296	51.4129	50.8693	50.8693	50.7686	51.0787	51.4129	51.6491	51.8961	(39)

Average = Sum(39)m / 12 = 51.5291

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0004	0.9978	0.9953	0.9834	0.9812	0.9708	0.9708	0.9689	0.9748	0.9812	0.9857	0.9904	(40)
HLP (average)												0.9834	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2234	45.7690	46.5531	47.9995	47.9273	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	179.2578	159.8890	157.0381	164.6294	167.7674	188.2314	199.7073	222.1853	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
									Total per year (kWh/year) = Sum(64)m =			2031.7064	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.5423	49.3871	48.3745	50.7793	51.8286	58.3828	62.3342	69.6725	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9944	89.6723	80.9944	83.6942	80.9944	83.6942	80.9944	80.9944	83.6942	80.9944	83.6942	80.9944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	74.6536	68.5933	65.0195	68.2518	71.9842	78.4716	86.5753	93.6458	(72)
Total internal gains	381.5973	389.8660	373.3183	359.0214	339.7764	323.2803	310.2355	311.8753	322.3205	337.6512	359.2389	373.7452	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southeast				2.1700		36.7938		0.6300		0.7000		0.7700	24.4009 (77)
Southwest				6.0900		36.7938		0.6300		0.7000		0.7700	68.4801 (79)
Solar gains	92.8810	158.2107	216.4708	268.2178	300.4263	298.2538	287.5485	263.5195	234.3921	174.8565	111.2500	79.4868 (83)	
Total gains	474.4783	548.0767	589.7891	627.2392	640.2027	621.5340	597.7840	575.3948	556.7126	512.5077	470.4889	453.2320 (84)	

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	69.4150	69.5950	69.7723	70.6174	70.7778	71.5341	71.5341	71.6760	71.2409	70.7778	70.4541	70.1188	
alpha	5.6277	5.6397	5.6515	5.7078	5.7185	5.7689	5.7689	5.7784	5.7494	5.7185	5.6969	5.6746	
util living area	0.9852	0.9671	0.9332	0.8484	0.7054	0.5177	0.3736	0.4046	0.6155	0.8686	0.9670	0.9881	(86)
MIT	20.1419	20.3440	20.5667	20.8072	20.9440	20.9920	20.9990	20.9984	20.9793	20.8110	20.4455	20.1066	(87)
Th 2	20.0830	20.0851	20.0873	20.0972	20.0991	20.1077	20.1077	20.1094	20.1044	20.0991	20.0953	20.0914	(88)
util rest of house	0.9809	0.9581	0.9157	0.8132	0.6496	0.4483	0.2983	0.3269	0.5427	0.8299	0.9565	0.9846	(89)
MIT 2	19.1061	19.3593	19.6320	19.9160	20.0560	20.1035	20.1074	20.1088	20.0921	19.9283	19.4967	19.0682	(90)
Living area fraction										fLA = Living area / (4) =		0.4752	(91)
MIT	19.5983	19.8272	20.0761	20.3395	20.4779	20.5257	20.5311	20.5315	20.5137	20.3477	19.9476	19.5617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5983	19.8272	20.0761	20.3395	20.4779	20.5257	20.5311	20.5315	20.5137	20.3477	19.9476	19.5617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9780	0.9552	0.9155	0.8233	0.6738	0.4811	0.3341	0.3639	0.5766	0.8415	0.9544	0.9821	(94)
Useful gains	464.0532	523.4984	539.9350	516.3851	431.3656	299.0319	199.7311	209.3607	321.0246	431.2563	449.0405	445.1091	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	801.9727	780.4931	708.0471	589.4741	451.2989	301.4377	199.9714	209.7523	327.6021	501.1596	663.5652	797.2093	(97)
Space heating kWh	251.4121	172.7004	125.0754	52.6241	14.8304	0.0000	0.0000	0.0000	0.0000	52.0081	154.4578	261.9625	(98a)
Space heating requirement - total per year (kWh/year)												1085.0707	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	251.4121	172.7004	125.0754	52.6241	14.8304	0.0000	0.0000	0.0000	0.0000	52.0081	154.4578	261.9625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1085.0707	
Space heating per m2											(98c) / (4) =	20.7075	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	251.4121	172.7004	125.0754	52.6241	14.8304	0.0000	0.0000	0.0000	0.0000	52.0081	154.4578	261.9625	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	272.0910	186.9052	135.3630	56.9524	16.0502	0.0000	0.0000	0.0000	0.0000	56.2858	167.1621	283.5093	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.8724	84.3276	83.5202	82.2008	80.9579	80.3000	80.3000	80.3000	80.3000	82.1628	84.0676	84.9813	(217)
Fuel for water heating, kWh/month	235.6887	210.0060	225.9828	203.8011	199.7318	180.4029	178.0251	186.3669	189.5660	206.7902	212.8587	233.0758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8290	13.5009	12.1560	8.9060	6.8793	5.6204	6.2755	8.1571	10.5953	13.9016	15.7019	17.2968	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0245	-26.3361	-39.2267	-45.7721	-50.8307	-48.0133	-47.4576	-44.0915	-38.3726	-30.8845	-20.1532	-15.4794	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5501	-16.1261	-32.4983	-49.4567	-66.0099	-66.5214	-65.7070	-55.3250	-40.1678	-23.2390	-10.1402	-5.9501	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1174.3190	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2462.2960	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8199	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2995.1011	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1174.3190	0.2100	246.6070	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2462.2960	0.2100	517.0822	(264)
Space and water heating			763.6891	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8199	0.1443	19.6030	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6423	0.1338	-56.8242	
PV Unit electricity exported	-438.6915	0.1255	-55.0660	
Total			-111.8902	(269)
Total CO2, kg/year			683.3313	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1174.3190	1.1300	1326.9805	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2462.2960	1.1300	2782.3944	(278)
Space and water heating			4109.3749	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8199	1.5338	208.3251	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6423	1.4945	-634.6363	
PV Unit electricity exported	-438.6915	0.4607	-202.1227	
Total			-836.7590	(283)
Total Primary energy kWh/year			3611.0418	(286)
Target Primary Energy Rate (TPER)			68.9100	(287)

Full SAP Calculation Printout

Property Reference	FLAT 10	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 10	**Prop Type Ref**	
Property			

SAP Rating	81 B	**DER**	11.52	**TER**	12.99
Environmental	92 A	**% DER < TER**			11.32
CO_2 Emissions (t/year)	0.56	**DFEE**	25.72	**TFEE**	26.69
Compliance Check	See BREL	**% DFEE < TFEE**			3.66
% DPER < TPER	-8.99	**DPER**	74.81	**TPER**	68.64

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.5610	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.0000	11.0000	18.0000	0.1200	2.1600			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1200	2.1984			(29a)
Total net area of external elements Aum(A, m2)			49.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9769			(33)
Main dwelling								
Party Wall 1			36.6100	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.8000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	21.8000	0.0700	1.5260	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.0000	0.0800	1.2000	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3970 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 22.3739 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7167	12.5810	12.4452	11.7664	11.6306	10.9518	10.9518	10.8160	11.2233	11.6306	11.9021	12.1737	(38)
Heat transfer coeff	35.0907	34.9549	34.8192	34.1403	34.0046	33.3257	33.3257	33.1900	33.5973	34.0046	34.2761	34.5476	(39)
Average = Sum(39)m / 12 =												34.1064	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6693	0.6667	0.6641	0.6512	0.6486	0.6356	0.6356	0.6330	0.6408	0.6486	0.6537	0.6589	(40)
HLP (average)												0.6505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)
Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)											Total = Sum(45)m =	1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.4908	(64)
12Total per year (kWh/year)												2274	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month	70.4926	62.3252	66.1327	57.9111	55.9881	50.2841	49.4861	51.5299	52.1866	58.3954	62.3480	69.6882	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8505	89.5130	80.8505	83.5455	80.8505	83.5455	80.8505	80.8505	83.5455	80.8505	83.5455	80.8505	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	94.7482	92.7458	88.8881	80.4321	75.2528	69.8391	66.5136	69.2606	72.4814	78.4885	86.5944	93.6670	(72)
Total internal gains	381.5659	389.8194	373.2841	358.9757	340.3117	324.4523	311.6572	312.8109	322.7416	337.6012	359.1918	373.7100	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	432.7253	476.9628	492.5175	506.7117	505.7884	488.7323	470.0407	457.9591	451.8463	433.9133	420.4690	417.4919	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	103.7589	104.1619	104.5681	106.6473	107.0731	109.2541	109.2541	109.7010	108.3711	107.0731	106.2248	105.3900	
alpha	7.9173	7.9441	7.9712	8.1098	8.1382	8.2836	8.2836	8.3134	8.2247	8.1382	8.0817	8.0260	
util living area	0.9746	0.9470	0.8992	0.7812	0.6200	0.4361	0.3119	0.3334	0.5120	0.7813	0.9369	0.9790	(86)
MIT	20.6319	20.7509	20.8609	20.9612	20.9941	20.9997	21.0000	21.0000	20.9989	20.9671	20.8146	20.6145	(87)
Th 2	20.3680	20.3703	20.3726	20.3842	20.3865	20.3980	20.3980	20.4004	20.3934	20.3865	20.3819	20.3773	(88)
util rest of house	0.9684	0.9355	0.8797	0.7496	0.5809	0.3952	0.2693	0.2899	0.4675	0.7443	0.9218	0.9738	(89)
MIT 2	19.9517	20.0983	20.2294	20.3488	20.3820	20.3979	20.3980	20.4004	20.3928	20.3581	20.1867	19.9383	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	20.2748	20.4082	20.5293	20.6396	20.6727	20.6837	20.6839	20.6851	20.6807	20.6473	20.4849	20.2594	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1248	20.2582	20.3793	20.4896	20.5227	20.5337	20.5339	20.5351	20.5307	20.4973	20.3349	20.1094	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9656	0.9332	0.8799	0.7551	0.5897	0.4045	0.2789	0.2997	0.4776	0.7512	0.9205	0.9711	(94)
Useful gains	417.8578	445.1127	433.3784	382.6404	298.2566	197.6797	131.0982	137.2403	215.7914	325.9658	387.0618	405.4412	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	555.3014	536.8454	483.2666	395.6739	300.0115	197.7452	131.1006	137.2446	216.0526	336.5542	453.6413	549.6333	(97)
Space heating kWh	102.2580	61.6444	37.1168	9.3842	1.3057	0.0000	0.0000	0.0000	0.0000	7.8778	47.9372	107.2790	(98a)
Space heating requirement - total per year (kWh/year)												374.8030	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	102.2580	61.6444	37.1168	9.3842	1.3057	0.0000	0.0000	0.0000	0.0000	7.8778	47.9372	107.2790	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												374.8030	
Space heating per m2											(98c) / (4) =	7.1486	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.5000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	102.2580	61.6444	37.1168	9.3842	1.3057	0.0000	0.0000	0.0000	0.0000	7.8778	47.9372	107.2790	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	114.2547	68.8765	41.4713	10.4851	1.4588	0.0000	0.0000	0.0000	0.0000	8.8020	53.5612	119.8648	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	194.0703	170.7677	179.4195	153.1730	145.3300	127.5436	123.4810	130.3488	133.9365	153.4195	168.0824	191.3672	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2713	57.1482	63.2713	61.2303	63.2713	61.2303	63.2713	63.2713	61.2303	63.2713	61.2303	63.2713	(231)
Lighting	16.7991	13.4769	12.1344	8.8902	6.8671	5.6104	6.2644	8.1426	10.5765	13.8769	15.6740	17.2660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	418.7743	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	1870.9394	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020)	103.9681	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	744.9681	(231)
Electricity for lighting (calculated in Appendix L)	135.5786	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3170.2604	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	418.7743	0.2100	87.9426	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.9394	0.2100	392.8973	(264)
Space and water heating			480.8399	(265)
Pumps, fans and electric keep-hot	744.9681	0.1387	103.3363	(267)
Energy for lighting	135.5786	0.1443	19.5682	(268)
Total CO2, kg/year			603.7443	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.5200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	418.7743	1.1300	473.2150	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.9394	1.1300	2114.1615	(278)
Space and water heating			2587.3765	(279)
Pumps, fans and electric keep-hot	744.9681	1.5128	1126.9877	(281)
Energy for lighting	135.5786	1.5338	207.9550	(282)
Total Primary energy kWh/year			3922.3192	(286)
Dwelling Primary energy Rate (DPER)			74.8100	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.5610	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3791	0.3715	0.3336	0.3260	0.2881	0.2881	0.2805	0.3032	0.3260	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2700	1.1450	9.4695			(27)

External Wall 1	29.0000	10.9100	18.0900	0.1800	3.2562	(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1800	3.2976	(29a)
Total net area of external elements Aum(A, m2)			49.5200			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.8633	(33)
Main dwelling						
Party Wall 1			36.6100	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.8000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.8000	0.0700	1.5260
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.0000	0.0200	0.3000
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.5270 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.3903 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8492	26.7136	26.5807	25.9565	25.8397	25.2960	25.2960	25.1953	25.5054	25.8397	26.0760	26.3230	(38)
Heat transfer coeff	52.2395	52.1039	51.9710	51.3468	51.2300	50.6863	50.6863	50.5856	50.8957	51.2300	51.4662	51.7133	(39)
Average = Sum(39)m / 12 =												51.3462	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9964	0.9938	0.9912	0.9793	0.9771	0.9667	0.9667	0.9648	0.9707	0.9771	0.9816	0.9863	(40)
HLP (average)												0.9793	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2370	45.7817	46.5660	48.0127	47.9406	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6519	198.8645	211.5393	186.4049	179.3073	159.9331	157.0814	164.6749	167.8137	188.2693	199.7488	222.2325	(62)
WWHRS	-24.5761	-21.7353	-22.7599	-18.8461	-17.5639	-15.0296	-14.0878	-14.9810	-15.5502	-18.3319	-20.7679	-24.1210	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0758	177.1292	188.7794	167.5588	161.7434	144.9036	142.9936	149.6939	152.2635	169.9374	178.9810	198.1116	(64)
									Total per year (kWh/year) = Sum(64)m =			2032.1712	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	70.4926	62.3252	66.1327	57.9111	55.5576	49.4008	48.3879	50.7934	51.8430	58.3954	62.3480	69.6882	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0251	89.7063	81.0251	83.7259	81.0251	83.7259	81.0251	81.0251	83.7259	81.0251	83.7259	81.0251	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	94.7482	92.7458	88.8881	80.4321	74.6742	68.6122	65.0375	68.2706	72.0041	78.4885	86.5944	93.6670	(72)
Total internal gains	381.7405	390.0127	373.4586	359.1561	339.9077	323.4058	310.3556	311.9955	322.4448	337.7758	359.3722	373.8846	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southeast			2.1800		36.7938		0.6300		0.7000		0.7700		24.5134 (77)
Southwest			6.0900		36.7938		0.6300		0.7000		0.7700		68.4801 (79)
Solar gains	92.9935	158.4023	216.7329	268.5425	300.7900	298.6149	287.8966	263.8385	234.6759	175.0682	111.3847	79.5830	(83)
Total gains	474.7339	548.4149	590.1915	627.6986	640.6977	622.0206	598.2522	575.8340	557.1207	512.8440	470.7569	453.4676	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6977	69.8791	70.0578	70.9095	71.0711	71.8335	71.8335	71.9764	71.5379	71.0711	70.7449	70.4069	
alpha	5.6465	5.6586	5.6705	5.7273	5.7381	5.7889	5.7889	5.7984	5.7692	5.7381	5.7163	5.6938	
util living area	0.9851	0.9668	0.9326	0.8470	0.7033	0.5157	0.3720	0.4028	0.6133	0.8673	0.9667	0.9880	(86)
MIT	20.1486	20.3504	20.5722	20.8108	20.9455	20.9923	20.9990	20.9985	20.9800	20.8143	20.4510	20.1133	(87)
Th 2	20.0864	20.0885	20.0906	20.1006	20.1025	20.1111	20.1111	20.1128	20.1078	20.1025	20.0987	20.0947	(88)
util rest of house	0.9807	0.9578	0.9150	0.8117	0.6477	0.4467	0.2973	0.3258	0.5409	0.8285	0.9561	0.9845	(89)
MIT 2	19.1172	19.3699	19.6413	19.9229	20.0605	20.1071	20.1108	20.1122	20.0958	19.9348	19.5062	19.0793	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.6070	19.8356	20.0834	20.3446	20.4808	20.5275	20.5327	20.5331	20.5157	20.3525	19.9549	19.5704	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6070	19.8356	20.0834	20.3446	20.4808	20.5275	20.5327	20.5331	20.5157	20.3525	19.9549	19.5704	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9548	0.9148	0.8219	0.6718	0.4793	0.3328	0.3624	0.5747	0.8402	0.9541	0.9820	(94)
Useful gains	464.2504	523.6534	539.9141	515.8984	430.4394	298.1263	199.1021	208.7018	320.1643	430.9114	449.1492	445.3026	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	799.6309	778.2012	705.9430	587.6427	449.8402	300.4427	199.3316	209.0764	326.5332	499.6178	661.5938	794.8527	(97)
Space heating kWh	249.5231	171.0561	123.5255	51.6559	14.4342	0.0000	0.0000	0.0000	0.0000	51.1176	152.9601	260.0653	(98a)
Space heating requirement - total per year (kWh/year)												1074.3377	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.5231	171.0561	123.5255	51.6559	14.4342	0.0000	0.0000	0.0000	0.0000	51.1176	152.9601	260.0653	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1074.3377	
Space heating per m2											(98c) / (4) =	20.4909	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	249.5231	171.0561	123.5255	51.6559	14.4342	0.0000	0.0000	0.0000	0.0000	51.1176	152.9601	260.0653	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	270.0466	185.1257	133.6856	55.9046	15.6214	0.0000	0.0000	0.0000	0.0000	55.3221	165.5412	281.4559	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0758	177.1292	188.7794	167.5588	161.7434	144.9036	142.9936	149.6939	152.2635	169.9374	178.9810	198.1116	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.8558	84.3067	83.4947	82.1732	80.9415	80.3000	80.3000	80.3000	80.3000	82.1374	84.0466	84.9654	(217)
Fuel for water heating, kWh/month	235.7833	210.1010	226.0974	203.9094	199.8275	180.4528	178.0743	186.4183	189.6183	206.8940	212.9545	233.1674	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8354	13.5060	12.1606	8.9094	6.8819	5.6226	6.2779	8.1602	10.5993	13.9069	15.7078	17.3033	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0344	-26.3504	-39.2477	-45.7962	-50.8571	-48.0381	-47.4820	-44.1143	-38.3927	-30.9010	-20.1642	-15.4880	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5549	-16.1362	-32.5183	-49.4871	-66.0504	-66.5622	-65.7474	-55.3591	-40.1926	-23.2535	-10.1465	-5.9538	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1162.7032	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2463.2982	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.8280	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2984.0447	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1162.7032	0.2100	244.1677	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2463.2982	0.2100	517.2926	(264)
Space and water heating			761.4603	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8714	0.1443	19.6104	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	0.1338	-56.8542	
PV Unit electricity exported	-438.9620	0.1255	-55.0999	
Total			-111.9542	(269)
Total CO2, kg/year			681.0458	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.9900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1162.7032	1.1300	1313.8546	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2463.2982	1.1300	2783.5269	(278)
Space and water heating			4097.3815	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8714	1.5338	208.4040	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	1.4945	-634.9711	
PV Unit electricity exported	-438.9620	0.4607	-202.2474	
Total			-837.2185	(283)
Total Primary energy kWh/year			3598.6679	(286)
Target Primary Energy Rate (TPER)			68.6400	(287)

Full SAP Calculation Printout

Property Reference	FLAT 11	**Issued on Date**	17/06/2025
Assessment Reference	Flat 11	**Prop Type Ref**	
Property			

SAP Rating	81 B	**DER**	11.53	**TER**	12.99
Environmental	92 A	**% DER < TER**			11.24
CO_2 Emissions (t/year)	0.56	**DFEE**	25.80	**TFEE**	26.71
Compliance Check	See BREL	**% DFEE < TFEE**			3.41
% DPER < TPER	-9.08	**DPER**	74.90	**TPER**	68.66

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.5610	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.0000	11.0000	18.0000	0.1200	2.1600			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1200	2.1984			(29a)
Total net area of external elements Aum(A, m2)			49.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9769			(33)
Main dwelling								
Party Wall 1			36.6100	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.8000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	21.8000	0.0700	1.5260	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.0000	0.0800	1.2000	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E2 Other lintels (including other steel lintels)	6.4000	0.2000	1.2800	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.4770 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	22.4539 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7167	12.5810	12.4452	11.7664	11.6306	10.9518	10.9518	10.8160	11.2233	11.6306	11.9021	12.1737	(38)
Heat transfer coeff	35.1707	35.0349	34.8992	34.2203	34.0846	33.4057	33.4057	33.2700	33.6773	34.0846	34.3561	34.6276	(39)
Average = Sum(39)m / 12 =												34.1864	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6708	0.6682	0.6656	0.6527	0.6501	0.6371	0.6371	0.6346	0.6423	0.6501	0.6553	0.6605	(40)
HLP (average)												0.6520	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)											Total = Sum(45)m =	1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.4908	(64)
12Total per year (kWh/year)												2274	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4926	62.3252	66.1327	57.9111	55.9881	50.2841	49.4861	51.5299	52.1866	58.3954	62.3480	69.6882	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8505	89.5130	80.8505	83.5455	80.8505	83.5455	80.8505	80.8505	83.5455	80.8505	83.5455	80.8505	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	94.7482	92.7458	88.8881	80.4321	75.2528	69.8391	66.5136	69.2606	72.4814	78.4885	86.5944	93.6670	(72)
Total internal gains	381.5659	389.8194	373.2841	358.9757	340.3117	324.4523	311.6572	312.8109	322.7416	337.6012	359.1918	373.7100	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	432.7253	476.9628	492.5175	506.7117	505.7884	488.7323	470.0407	457.9591	451.8463	433.9133	420.4690	417.4919	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	103.5229	103.9241	104.3284	106.3980	106.8218	108.9925	108.9925	109.4372	108.1137	106.8218	105.9775	105.1465	
alpha	7.9015	7.9283	7.9552	8.0932	8.1215	8.2662	8.2662	8.2958	8.2076	8.1215	8.0652	8.0098	
util living area	0.9748	0.9474	0.9000	0.7825	0.6214	0.4372	0.3127	0.3342	0.5132	0.7825	0.9375	0.9791	(86)
MIT	20.6292	20.7485	20.8592	20.9605	20.9939	20.9997	21.0000	21.0000	20.9989	20.9664	20.8126	20.6118	(87)
Th 2	20.3667	20.3690	20.3713	20.3828	20.3851	20.3967	20.3967	20.3990	20.3921	20.3851	20.3805	20.3759	(88)
util rest of house	0.9686	0.9360	0.8805	0.7508	0.5821	0.3961	0.2698	0.2905	0.4685	0.7456	0.9224	0.9740	(89)
MIT 2	19.9473	20.0943	20.2262	20.3467	20.3805	20.3965	20.3967	20.3990	20.3914	20.3562	20.1832	19.9337	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	20.2711	20.4050	20.5268	20.6382	20.6718	20.6830	20.6832	20.6844	20.6799	20.6460	20.4822	20.2557	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1211	20.2550	20.3768	20.4882	20.5218	20.5330	20.5332	20.5344	20.5299	20.4960	20.3322	20.1057	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9659	0.9337	0.8807	0.7564	0.5909	0.4054	0.2795	0.3003	0.4786	0.7525	0.9211	0.9713	(94)
Useful gains	417.9583	445.3332	433.7631	383.2660	298.8868	198.1279	131.3888	137.5471	216.2725	326.5048	387.2995	405.5246	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	556.4395	537.9608	484.2896	396.5525	300.6884	198.1957	131.3914	137.5516	216.5421	337.3016	454.6050	550.7779	(97)
Space heating kWh	103.0300	62.2458	37.5917	9.5663	1.3404	0.0000	0.0000	0.0000	0.0000	8.0328	48.4600	108.0684	(98a)
Space heating requirement - total per year (kWh/year)												378.3355	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	103.0300	62.2458	37.5917	9.5663	1.3404	0.0000	0.0000	0.0000	0.0000	8.0328	48.4600	108.0684	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												378.3355	
Space heating per m2											(98c) / (4) =	7.2160	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	103.0300	62.2458	37.5917	9.5663	1.3404	0.0000	0.0000	0.0000	0.0000	8.0328	48.4600	108.0684	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	115.1174	69.5483	42.0020	10.6886	1.4977	0.0000	0.0000	0.0000	0.0000	8.9752	54.1452	120.7469	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	194.0703	170.7677	179.4195	153.1730	145.3300	127.5436	123.4810	130.3488	133.9365	153.4195	168.0824	191.3672	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2713	57.1482	63.2713	61.2303	63.2713	61.2303	63.2713	63.2713	61.2303	63.2713	61.2303	63.2713	(231)
Lighting	16.7991	13.4769	12.1344	8.8902	6.8671	5.6104	6.2644	8.1426	10.5765	13.8769	15.6740	17.2660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 422.7212 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 1870.9394 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020) 103.9681 (230a)

central heating pump 41.0000 (230c)

maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)

Total electricity for the above, kWh/year 744.9681 (231)

Electricity for lighting (calculated in Appendix L) 135.5786 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3174.2073	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	422.7212	0.2100	88.7715	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.9394	0.2100	392.8973	(264)
Space and water heating			481.6687	(265)
Pumps, fans and electric keep-hot	744.9681	0.1387	103.3363	(267)
Energy for lighting	135.5786	0.1443	19.5682	(268)
Total CO2, kg/year			604.5732	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.5300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	422.7212	1.1300	477.6750	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.9394	1.1300	2114.1615	(278)
Space and water heating			2591.8365	(279)
Pumps, fans and electric keep-hot	744.9681	1.5128	1126.9877	(281)
Energy for lighting	135.5786	1.5338	207.9550	(282)
Total Primary energy kWh/year			3926.7792	(286)
Dwelling Primary energy Rate (DPER)			74.9000	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.5610	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3791	0.3715	0.3336	0.3260	0.2881	0.2881	0.2805	0.3032	0.3260	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2700	1.1450	9.4695			(27)

External Wall 1	29.0000	10.9100	18.0900	0.1800	3.2562		(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1800	3.2976		(29a)
Total net area of external elements Aum(A, m2)			49.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.8633		(33)
Main dwelling							
Party Wall 1			36.6100	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.8000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.8000	0.0700	1.5260
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.0000	0.0200	0.3000
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E2 Other lintels (including other steel lintels)	6.4000	0.0500	0.3200
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.5470	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	25.4103	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8492	26.7136	26.5807	25.9565	25.8397	25.2960	25.2960	25.1953	25.5054	25.8397	26.0760	26.3230	(38)
Heat transfer coeff	52.2595	52.1239	51.9910	51.3668	51.2500	50.7063	50.7063	50.6056	50.9157	51.2500	51.4862	51.7333	(39)
Average = Sum(39)m / 12 =												51.3662	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9967	0.9942	0.9916	0.9797	0.9775	0.9671	0.9671	0.9652	0.9711	0.9775	0.9820	0.9867	(40)
HLP (average)												0.9797	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2370	45.7817	46.5660	48.0127	47.9406	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6519	198.8645	211.5393	186.4049	179.3073	159.9331	157.0814	164.6749	167.8137	188.2693	199.7488	222.2325	(62)
WWHRS	-24.5761	-21.7353	-22.7599	-18.8461	-17.5639	-15.0296	-14.0878	-14.9810	-15.5502	-18.3319	-20.7679	-24.1210	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0758	177.1292	188.7794	167.5588	161.7434	144.9036	142.9936	149.6939	152.2635	169.9374	178.9810	198.1116	(64)
									Total per year (kWh/year) = Sum(64)m =			2032.1712	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	70.4926	62.3252	66.1327	57.9111	55.5576	49.4008	48.3879	50.7934	51.8430	58.3954	62.3480	69.6882	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0251	89.7063	81.0251	83.7259	81.0251	83.7259	81.0251	81.0251	83.7259	81.0251	83.7259	81.0251	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	94.7482	92.7458	88.8881	80.4321	74.6742	68.6122	65.0375	68.2706	72.0041	78.4885	86.5944	93.6670	(72)
Total internal gains	381.7405	390.0127	373.4586	359.1561	339.9077	323.4058	310.3556	311.9955	322.4448	337.7758	359.3722	373.8846	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southeast			2.1800		36.7938		0.6300		0.7000		0.7700		24.5134 (77)
Southwest			6.0900		36.7938		0.6300		0.7000		0.7700		68.4801 (79)
Solar gains	92.9935	158.4023	216.7329	268.5425	300.7900	298.6149	287.8966	263.8385	234.6759	175.0682	111.3847	79.5830	(83)
Total gains	474.7339	548.4149	590.1915	627.6986	640.6977	622.0206	598.2522	575.8340	557.1207	512.8440	470.7569	453.4676	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6710	69.8523	70.0308	70.8819	71.0434	71.8051	71.8051	71.9480	71.5098	71.0434	70.7174	70.3797	
alpha	5.6447	5.6568	5.6687	5.7255	5.7362	5.7870	5.7870	5.7965	5.7673	5.7362	5.7145	5.6920	
util living area													
	0.9851	0.9668	0.9326	0.8471	0.7035	0.5159	0.3722	0.4030	0.6135	0.8675	0.9668	0.9881	(86)
MIT	20.1480	20.3498	20.5717	20.8105	20.9453	20.9923	20.9990	20.9985	20.9799	20.8140	20.4505	20.1127	(87)
Th 2	20.0860	20.0882	20.0903	20.1003	20.1021	20.1108	20.1108	20.1124	20.1075	20.1021	20.0984	20.0944	(88)
util rest of house													
	0.9807	0.9578	0.9150	0.8118	0.6479	0.4468	0.2974	0.3259	0.5411	0.8287	0.9561	0.9846	(89)
MIT 2	19.1161	19.3689	19.6404	19.9223	20.0601	20.1067	20.1105	20.1119	20.0955	19.9342	19.5053	19.0782	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.6062	19.8348	20.0827	20.3441	20.4805	20.5273	20.5325	20.5329	20.5155	20.3520	19.9542	19.5695	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6062	19.8348	20.0827	20.3441	20.4805	20.5273	20.5325	20.5329	20.5155	20.3520	19.9542	19.5695	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9549	0.9149	0.8220	0.6720	0.4794	0.3329	0.3626	0.5749	0.8404	0.9541	0.9820	(94)
Useful gains	464.2555	523.6688	539.9490	515.9756	430.5511	298.2271	199.1711	208.7742	320.2624	430.9687	449.1631	445.3063	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	799.8928	778.4578	706.1784	587.8463	450.0010	300.5517	199.4016	209.1504	326.6506	499.7892	661.8140	795.1159	(97)
Space heating kWh													
	249.7142	171.2182	123.6747	51.7469	14.4707	0.0000	0.0000	0.0000	0.0000	51.2025	153.1087	260.2583	(98a)
Space heating requirement - total per year (kWh/year)												1075.3943	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	249.7142	171.2182	123.6747	51.7469	14.4707	0.0000	0.0000	0.0000	0.0000	51.2025	153.1087	260.2583	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1075.3943	
Space heating per m2											(98c) / (4) =	20.5110	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	249.7142	171.2182	123.6747	51.7469	14.4707	0.0000	0.0000	0.0000	0.0000	51.2025	153.1087	260.2583	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	270.2534	185.3011	133.8471	56.0032	15.6610	0.0000	0.0000	0.0000	0.0000	55.4139	165.7020	281.6649	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	200.0758	177.1292	188.7794	167.5588	161.7434	144.9036	142.9936	149.6939	152.2635	169.9374	178.9810	198.1116	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.8574	84.3087	83.4971	82.1758	80.9430	80.3000	80.3000	80.3000	80.3000	82.1398	84.0486	84.9670	(217)
Fuel for water heating, kWh/month													
	235.7787	210.0960	226.0908	203.9030	199.8238	180.4528	178.0743	186.4183	189.6183	206.8880	212.9493	233.1630	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8354	13.5060	12.1606	8.9094	6.8819	5.6226	6.2779	8.1602	10.5993	13.9069	15.7078	17.3033	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0344	-26.3504	-39.2477	-45.7962	-50.8571	-48.0381	-47.4820	-44.1143	-38.3927	-30.9010	-20.1642	-15.4880	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5549	-16.1362	-32.5183	-49.4871	-66.0504	-66.5622	-65.7474	-55.3591	-40.1926	-23.2535	-10.1465	-5.9538	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1163.8466	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2463.2563	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.8280	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2985.1462	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1163.8466	0.2100	244.4078	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2463.2563	0.2100	517.2838	(264)
Space and water heating			761.6916	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8714	0.1443	19.6104	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	0.1338	-56.8542	
PV Unit electricity exported	-438.9620	0.1255	-55.0999	
Total			-111.9542	(269)
Total CO2, kg/year			681.2771	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.9900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1163.8466	1.1300	1315.1467	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2463.2563	1.1300	2783.4796	(278)
Space and water heating			4098.6263	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8714	1.5338	208.4040	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	1.4945	-634.9711	
PV Unit electricity exported	-438.9620	0.4607	-202.2474	
Total			-837.2185	(283)
Total Primary energy kWh/year			3599.9127	(286)
Target Primary Energy Rate (TPER)			68.6600	(287)

Full SAP Calculation Printout

Property Reference	FLAT 12	**Issued on Date**	17/06/2025
Assessment Reference	Flat 12	**Prop Type Ref**	
Property			

SAP Rating	81 B	**DER**	12.13	**TER**	13.41
Environmental	91 B	**% DER < TER**			9.55
CO_2 Emissions (t/year)	0.65	**DFEE**	31.67	**TFEE**	31.55
Compliance Check	See BREL	**% DFEE < TFEE**			-0.37
% DPER < TPER	-8.44	**DPER**	76.85	**TPER**	70.87

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0300	(1b)	x 2.7000	(2b) =	162.0810	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	162.0810	(5)

---

2. Ventilation rate

---

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)
Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			12.3200	0.8687	10.7027			(27)
OPAQUE			5.2800	0.9000	4.7520			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	53.0000	17.6000	35.4000	0.1200	4.2480			(29a)
EXPOSED WALL TO CORRIDOR	8.3700	2.2000	6.1700	0.1200	0.7404			(29a)
Total net area of external elements Aum(A, m2)			61.3700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.4231			(33)
Main dwelling								
Party Wall 1			28.4800	0.0000	0.0000			(32)
Party Floor 1			60.0300					(32d)
Party Ceiling 1			60.0300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.7500	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	28.7000	0.0700	2.0090	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	16.8000	0.0800	1.3440	
E16 Corner (normal)	13.5000	0.0900	1.2150	
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860	
E25 Staggered party wall between dwellings	8.1000	0.0800	0.6480	
E18 Party wall between dwellings	2.7000	0.0600	0.1620	
P8 Party Wall - Exposed floor (inverted)	4.3600	0.2400	1.0464	
E2 Other lintels (including other steel lintels)	9.0000	0.2000	1.8000	
E3 Sill	5.6000	0.0400	0.2240	
E4 Jamb	39.6000	0.0500	1.9800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3655 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3273	15.1568	14.9863	14.1339	13.9634	13.1109	13.1109	12.9404	13.4519	13.9634	14.3044	14.6453	(38)
Heat transfer coeff	47.6928	47.5223	47.3518	46.4994	46.3289	45.4764	45.4764	45.3059	45.8174	46.3289	46.6699	47.0108	(39)

Average = Sum(39)m / 12 = 46.4567

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7945	0.7916	0.7888	0.7746	0.7718	0.7576	0.7576	0.7547	0.7632	0.7718	0.7774	0.7831	(40)
HLP (average)												0.7739	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9825 (42)

Hot water usage for mixer showers

57.4593	56.5958	55.3375	52.9300	51.1533	49.1720	48.0458	49.2945	50.6634	52.7908	55.2500	57.2391	(42a)

Hot water usage for baths

24.8326	24.4638	23.9445	22.9869	22.2698	21.4748	21.0453	21.5610	22.1226	22.9733	23.9506	24.7486	(42b)

Hot water usage for other uses

34.9326	33.6623	32.3920	31.1218	29.8515	28.5812	28.5812	29.8515	31.1218	32.3920	33.6623	34.9326	(42c)

Average daily hot water use (litres/day) 107.7562 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.2245	114.7219	111.6740	107.0386	103.2746	99.2280	97.6723	100.7071	103.9077	108.1561	112.8629	116.9204	(44)
Energy conte	185.6549	163.3625	171.6388	146.5305	139.0275	122.0123	118.1262	124.6964	128.1286	146.7668	160.7939	183.0691	(45)
Energy content (annual)										Total = Sum(45)m =		1789.8076	
Distribution loss (46)m = 0.15 x (45)m	27.8482	24.5044	25.7458	21.9796	20.8541	18.3019	17.7189	18.7045	19.2193	22.0150	24.1191	27.4604	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	236.6138	209.3899	222.5977	195.8456	189.9864	171.3274	169.0851	175.6553	177.4437	197.7257	210.1090	234.0280	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.6138	209.3899	222.5977	195.8456	189.9864	171.3274	169.0851	175.6553	177.4437	197.7257	210.1090	234.0280	(64)
										Total per year (kWh/year) = Sum(64)m =		2389.8076	(64)
12Total per year (kWh/year)												2390	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	74.4700	65.8249	69.8096	61.0502	58.9664	52.8979	52.0167	54.2013	54.9315	61.5397	65.7927	73.6102	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.6677	97.0607	87.6677	90.5900	87.6677	90.5900	87.6677	87.6677	90.5900	87.6677	90.5900	87.6677	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.0226	174.8180	170.2936	160.6616	148.5030	137.0755	129.4413	127.6459	132.1703	141.8023	153.9610	165.3884	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	(71)
Water heating gains (Table 5)	100.0941	97.9537	93.8301	84.7919	79.2559	73.4693	69.9149	72.8512	76.2938	82.7146	91.3788	98.9384	(72)
Total internal gains	416.5216	425.5696	407.5286	391.7807	371.1638	353.8720	339.7612	340.9020	351.7913	367.9219	391.6670	407.7317	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	75.3929	128.4219	175.7125	217.7163	243.8604	242.0969	233.4073	213.9026	190.2595	141.9336	90.3033	64.5206	(83)
Total gains	491.9145	553.9915	583.2411	609.4970	615.0242	595.9689	573.1684	554.8046	542.0508	509.8555	481.9702	472.2523	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	87.4084	87.7220	88.0378	89.6517	89.9817	91.6683	91.6683	92.0133	90.9861	89.9817	89.3242	88.6764	
alpha	6.8272	6.8481	6.8692	6.9768	6.9988	7.1112	7.1112	7.1342	7.0657	6.9988	6.9549	6.9118	
util living area	0.9854	0.9672	0.9321	0.8370	0.6821	0.4868	0.3490	0.3754	0.5778	0.8489	0.9641	0.9883	(86)
MIT	20.4048	20.5619	20.7267	20.8994	20.9782	20.9982	20.9999	20.9998	20.9943	20.9060	20.6474	20.3818	(87)
Th 2	20.2581	20.2606	20.2630	20.2754	20.2779	20.2903	20.2903	20.2927	20.2853	20.2779	20.2729	20.2680	(88)
util rest of house	0.9814	0.9588	0.9159	0.8048	0.6351	0.4336	0.2928	0.3178	0.5203	0.8122	0.9535	0.9851	(89)
MIT 2	19.5762	19.7733	19.9747	20.1810	20.2611	20.2893	20.2902	20.2927	20.2819	20.1936	19.8914	19.5555	(90)
Living area fraction										fLA = Living area / (4) =		0.4844	(91)
MIT	19.9776	20.1553	20.3390	20.5290	20.6085	20.6327	20.6340	20.6352	20.6270	20.5387	20.2576	19.9558	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8276	20.0053	20.1890	20.3790	20.4585	20.4827	20.4840	20.4852	20.4770	20.3887	20.1076	19.8058	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9555	0.9140	0.8097	0.6471	0.4481	0.3081	0.3335	0.5358	0.8183	0.9507	0.9825	(94)
Useful gains	481.3715	529.3163	533.1016	493.5168	397.9746	267.0296	176.6015	185.0350	290.4561	417.1904	458.2289	463.9878	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	740.5551	717.8389	648.2007	533.7658	405.7709	267.5257	176.6298	185.0839	292.1776	453.4997	607.0642	733.6398	(97)
Space heating kWh	192.8326	126.6872	85.6338	28.9793	5.8005	0.0000	0.0000	0.0000	0.0000	27.0141	107.1614	200.6210	(98a)
Space heating requirement - total per year (kWh/year)												774.7298	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	192.8326	126.6872	85.6338	28.9793	5.8005	0.0000	0.0000	0.0000	0.0000	27.0141	107.1614	200.6210	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												774.7298	
Space heating per m2											(98c) / (4) =	12.9057	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	192.8326	126.6872	85.6338	28.9793	5.8005	0.0000	0.0000	0.0000	0.0000	27.0141	107.1614	200.6210	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	215.4554	141.5499	95.6802	32.3791	6.4810	0.0000	0.0000	0.0000	0.0000	30.1833	119.7334	224.1576	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	236.6138	209.3899	222.5977	195.8456	189.9864	171.3274	169.0851	175.6553	177.4437	197.7257	210.1090	234.0280	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	207.4357	182.5279	191.7752	163.7213	155.3380	136.3266	131.9846	139.3256	143.1605	163.9853	179.6580	204.5464	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	64.5512	58.3043	64.5512	62.4689	64.5512	62.4689	64.5512	64.5512	62.4689	64.5512	62.4689	64.5512	(231)
Lighting	18.2156	14.6132	13.1576	9.6398	7.4461	6.0835	6.7926	8.8292	11.4683	15.0470	16.9956	18.7219	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 865.6199 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 1999.7850 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020) 119.0388 (230a)

central heating pump 41.0000 (230c)

maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)

Total electricity for the above, kWh/year 760.0388 (231)

Electricity for lighting (calculated in Appendix L) 147.0105 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3772.4541	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	865.6199	0.2100	181.7802	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1999.7850	0.2100	419.9549	(264)
Space and water heating			601.7350	(265)
Pumps, fans and electric keep-hot	760.0388	0.1387	105.4267	(267)
Energy for lighting	147.0105	0.1443	21.2182	(268)
Total CO2, kg/year			728.3799	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.1300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	865.6199	1.1300	978.1505	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1999.7850	1.1300	2259.7571	(278)
Space and water heating			3237.9076	(279)
Pumps, fans and electric keep-hot	760.0388	1.5128	1149.7867	(281)
Energy for lighting	147.0105	1.5338	225.4895	(282)
Total Primary energy kWh/year			4613.1838	(286)
Dwelling Primary energy Rate (DPER)			76.8500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0300	(1b)	x 2.7000	(2b) =	162.0810	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	162.0810	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3734	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3174	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4047	0.3967	0.3888	0.3491	0.3412	0.3015	0.3015	0.2936	0.3174	0.3412	0.3571	0.3729	(22b)
Effective ac	0.5819	0.5787	0.5756	0.5609	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5637	0.5695	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			7.4800	1.0000	7.4800			(26)

TER Opening Type			7.5200	1.1450	8.6107	(27)
External Wall 1	53.0000	12.8000	40.2000	0.1800	7.2360	(29a)
EXPOSED WALL TO CORRIDOR	8.3700	2.2000	6.1700	0.1800	1.1106	(29a)
Total net area of external elements Aum(A, m2)			61.3700			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.4373	(33)
Main dwelling						
Party Wall 1			28.4800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.7500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	28.7000	0.0700	2.0090
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	16.8000	0.0200	0.3360
E16 Corner (normal)	13.5000	0.0900	1.2150
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
E25 Staggered party wall between dwellings	8.1000	0.0600	0.4860
E18 Party wall between dwellings	2.7000	0.0600	0.1620
P8 Party Wall - Exposed floor (inverted)	4.3600	0.2400	1.0464
E2 Other lintels (including other steel lintels)	9.0000	0.0500	0.4500
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	39.6000	0.0500	1.9800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4784 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.9157 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.1227	30.9527	30.7860	30.0031	29.8566	29.1747	29.1747	29.0484	29.4373	29.8566	30.1529	30.4627	(38)
Heat transfer coeff	63.0384	62.8684	62.7017	61.9187	61.7723	61.0904	61.0904	60.9641	61.3530	61.7723	62.0686	62.3784	(39)
Average = Sum(39)m / 12 =												61.9180	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0501	1.0473	1.0445	1.0315	1.0290	1.0177	1.0177	1.0156	1.0220	1.0290	1.0340	1.0391	(40)
HLP (average)												1.0315	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9825 (42)

Hot water usage for mixer showers

57.4593	56.5958	55.3375	52.9300	51.1533	49.1720	48.0458	49.2945	50.6634	52.7908	55.2500	57.2391	(42a)

Hot water usage for baths

24.8326	24.4638	23.9445	22.9869	22.2698	21.4748	21.0453	21.5610	22.1226	22.9733	23.9506	24.7486	(42b)

Hot water usage for other uses

34.9326	33.6623	32.3920	31.1218	29.8515	28.5812	28.5812	29.8515	31.1218	32.3920	33.6623	34.9326	(42c)

Average daily hot water use (litres/day) 107.7562 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.2245	114.7219	111.6740	107.0386	103.2746	99.2280	97.6723	100.7071	103.9077	108.1561	112.8629	116.9204	(44)
Energy conte	185.6549	163.3625	171.6388	146.5305	139.0275	122.0123	118.1262	124.6964	128.1286	146.7668	160.7939	183.0691	(45)
Energy content (annual)										Total = Sum(45)m =		1789.8076	
Distribution loss (46)m = 0.15 x (45)m	27.8482	24.5044	25.7458	21.9796	20.8541	18.3019	17.7189	18.7045	19.2193	22.0150	24.1191	27.4604	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	48.9343	49.7727	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	236.6138	209.3899	222.5977	195.8456	189.9864	170.9467	167.8989	175.6553	177.4437	197.7257	210.1090	234.0280	(62)
WWHRS	-26.2680	-23.2316	-24.3268	-20.1436	-18.7731	-16.0643	-15.0577	-16.0123	-16.6207	-19.5940	-22.1976	-25.7815	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	210.3459	186.1582	198.2709	175.7020	171.2133	154.8824	152.8412	159.6430	160.8230	178.1318	187.9114	208.2464	(64)
										Total per year (kWh/year) = Sum(64)m =		2144.1696	(64)
12Total per year (kWh/year)												2144	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	74.4700	65.8249	69.8096	61.0502	58.9664	52.8027	51.7201	54.2013	54.9315	61.5397	65.7927	73.6102	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.9478	106.2279	95.9478	99.1460	95.9478	99.1460	95.9478	95.9478	99.1460	95.9478	99.1460	95.9478	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.0226	174.8180	170.2936	160.6616	148.5030	137.0755	129.4413	127.6459	132.1703	141.8023	153.9610	165.3884	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	(71)
Water heating gains (Table 5)	100.0941	97.9537	93.8301	84.7919	79.2559	73.3371	69.5163	72.8512	76.2938	82.7146	91.3788	98.9384	(72)
Total internal gains	424.8017	434.7368	415.8087	400.3368	379.4438	362.2959	347.6427	349.1821	360.3474	376.2020	400.2230	416.0118	(73)

---

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
Southeast				3.7600		36.7938	0.6300	0.7000		0.7700		42.2800	(77)
Southwest				3.7600		36.7938	0.6300	0.7000		0.7700		42.2800	(79)
Solar gains	84.5599	144.0369	197.0775	244.1886	273.5116	271.5337	261.7875	239.9112	213.3933	159.1914	101.2833	72.3657	(83)
Total gains	509.3616	578.7737	612.8863	644.5254	652.9554	633.8296	609.4301	589.0933	573.7407	535.3934	501.5064	488.3775	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.1303	66.3092	66.4855	67.3261	67.4858	68.2391	68.2391	68.3804	67.9469	67.4858	67.1636	66.8300	
alpha	5.4087	5.4206	5.4324	5.4884	5.4991	5.5493	5.5493	5.5587	5.5298	5.4991	5.4776	5.4553	
util living area	0.9897	0.9787	0.9585	0.9019	0.7872	0.5999	0.4384	0.4720	0.6961	0.9119	0.9779	0.9916	(86)
MIT	20.0022	20.1889	20.4142	20.6935	20.8896	20.9804	20.9971	20.9956	20.9562	20.7184	20.3208	19.9727	(87)
Th 2	20.0418	20.0441	20.0464	20.0572	20.0592	20.0686	20.0686	20.0704	20.0650	20.0592	20.0551	20.0509	(88)
util rest of house	0.9866	0.9725	0.9461	0.8736	0.7327	0.5198	0.3471	0.3788	0.6176	0.8806	0.9703	0.9891	(89)
MIT 2	18.8987	19.1352	19.4167	19.7580	19.9702	20.0579	20.0677	20.0689	20.0377	19.7948	19.3119	18.8682	(90)
Living area fraction									fLA = Living area / (4) =			0.4844	(91)
MIT	19.4332	19.6456	19.8999	20.2112	20.4156	20.5048	20.5179	20.5178	20.4826	20.2422	19.8006	19.4033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4332	19.6456	19.8999	20.2112	20.4156	20.5048	20.5179	20.5178	20.4826	20.2422	19.8006	19.4033	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9693	0.9439	0.8787	0.7545	0.5581	0.3914	0.4240	0.6540	0.8874	0.9677	0.9868	(94)
Useful gains	501.2445	560.9926	578.4843	566.3734	492.6280	353.7407	238.5321	249.7772	375.2000	475.1262	485.3218	481.9471	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	953.9748	927.0334	840.1967	700.3741	538.3828	360.7238	239.3466	251.0390	391.5943	595.6216	788.3082	948.3549	(97)
Space heating kWh	336.8314	245.9794	194.7140	96.4805	34.0416	0.0000	0.0000	0.0000	0.0000	89.6486	218.1502	347.0074	(98a)
Space heating requirement - total per year (kWh/year)												1562.8531	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.8314	245.9794	194.7140	96.4805	34.0416	0.0000	0.0000	0.0000	0.0000	89.6486	218.1502	347.0074	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1562.8531	
Space heating per m2											(98c) / (4) =	26.0345	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.8314	245.9794	194.7140	96.4805	34.0416	0.0000	0.0000	0.0000	0.0000	89.6486	218.1502	347.0074	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	364.5361	266.2115	210.7295	104.4162	36.8416	0.0000	0.0000	0.0000	0.0000	97.0223	236.0933	375.5491	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	210.3459	186.1582	198.2709	175.7020	171.2133	154.8824	152.8412	159.6430	160.8230	178.1318	187.9114	208.2464	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3846	84.9794	84.3426	83.1513	81.6093	80.3000	80.3000	80.3000	80.3000	82.9877	84.7020	85.4670	(217)
Fuel for water heating, kWh/month	246.3509	219.0629	235.0778	211.3040	209.7963	192.8797	190.3378	198.8082	200.2777	214.6485	221.8499	243.6570	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9361	15.9934	14.4003	10.5503	8.1493	6.6581	7.4341	9.6631	12.5515	16.4682	18.6008	20.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.5668	-30.0036	-44.6109	-51.9478	-57.5806	-54.3346	-53.6972	-49.9415	-43.5446	-35.1353	-22.9769	-17.6675	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.7317	-18.6416	-37.5580	-57.1473	-76.2732	-76.8776	-75.9453	-63.9510	-46.4320	-26.8692	-11.7276	-6.8824	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1691.3995	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	80.3000	
Water heating fuel used	2584.0506	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.8954	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-989.0444	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3533.3011	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.3995	0.2100	355.1939	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2584.0506	0.2100	542.6506	(264)
Space and water heating			897.8445	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8954	0.1443	23.2222	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-482.0073	0.1339	-64.5218	
PV Unit electricity exported	-507.0371	0.1255	-63.6455	
Total			-128.1672	(269)
Total CO2, kg/year			804.8287	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.3995	1.1300	1911.2814	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2584.0506	1.1300	2919.9772	(278)
Space and water heating			4831.2586	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8954	1.5338	246.7867	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-482.0073	1.4947	-720.4490	
PV Unit electricity exported	-507.0371	0.4607	-233.6140	
Total			-954.0630	(283)
Total Primary energy kWh/year			4254.0831	(286)
Target Primary Energy Rate (TPER)			70.8700	(287)

Full SAP Calculation Printout

Property Reference	FLAT 13	**Issued on Date**	17/06/2025
Assessment Reference	Flat 13	**Prop Type Ref**	
Property			

SAP Rating	79 C	**DER**	14.76	**TER**	16.52
Environmental	90 B	**% DER < TER**			10.65
CO_2 Emissions (t/year)	0.71	**DFEE**	41.90	**TFEE**	43.38
Compliance Check	See BREL	**% DFEE < TFEE**			3.40
% DPER < TPER	-4.93	**DPER**	91.93	**TPER**	87.61

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.8500	(1b)	x 2.7000	(2b) =	145.3950	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	145.3950	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			11.4400	0.8687	9.9382			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
Door			2.2000	0.9000	1.9800			(26)
EXPOSED FLOOR			27.4000	0.0900	2.4660			(28b)
Ext floor			10.3500	0.0900	0.9315			(28b)
External Wall 1	32.4000	14.0800	18.3200	0.1200	2.1984			(29a)
Exposed Internal Wall	27.0000	2.2000	24.8000	0.1200	2.9760			(29a)
Total net area of external elements Aum(A, m2)			97.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.8661			(33)
Main dwelling								
Party Wall 1			27.8000	0.0000	0.0000			(32)
Party Floor 1			16.1000					(32d)
Party Ceiling 1			53.8500					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.7000	0.0700	0.6090
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	12.1000	0.0800	0.9680
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.3000	0.0000	0.0000
E25 Staggered party wall between dwellings	10.8000	0.0800	0.8640
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E20 Exposed floor (normal)	12.2500	0.3200	3.9200
P8 Party Wall - Exposed floor (inverted)	24.0000	0.2400	5.7600
E24 Eaves (insulation at ceiling level - inverted)	3.7000	0.2400	0.8880
E2 Other lintels (including other steel lintels)	7.4000	0.2000	1.4800
E3 Sill	5.2000	0.0400	0.2080
E4 Jamb	30.8000	0.0500	1.5400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.4800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.3461 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0612	12.9217	12.7823	12.0851	11.9456	11.2484	11.2484	11.1090	11.5273	11.9456	12.2245	12.5034	(38)
Heat transfer coeff	52.4073	52.2678	52.1284	51.4312	51.2917	50.5945	50.5945	50.4551	50.8734	51.2917	51.5706	51.8495	(39)

Average = Sum(39)m / 12 = 51.3963

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9732	0.9706	0.9680	0.9551	0.9525	0.9395	0.9395	0.9370	0.9447	0.9525	0.9577	0.9629	(40)
HLP (average)												0.9544	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8036 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.4598	53.6414	52.4488	50.1670	48.4830	46.6051	45.5377	46.7213	48.0187	50.0350	52.3659	54.2512	(42a)

Hot water usage for baths

23.5427	23.1931	22.7007	21.7929	21.1131	20.3593	19.9522	20.4411	20.9735	21.7800	22.7066	23.4631	(42b)

Hot water usage for other uses

33.1006	31.8969	30.6933	29.4896	28.2859	27.0823	27.0823	28.2859	29.4896	30.6933	31.8969	33.1006	(42c)

Average daily hot water use (litres/day) 102.1294 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.1031	108.7314	105.8428	101.4494	97.8821	94.0467	92.5722	95.4483	98.4818	102.5083	106.9693	110.8149	(44)
Energy conte	175.9602	154.8321	162.6764	138.8792	131.7681	115.6414	111.9580	118.1850	121.4379	139.1028	152.3974	173.5093	(45)

Energy content (annual) Total = Sum(45)m = 1696.3477

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

26.3940	23.2248	24.4015	20.8319	19.7652	17.3462	16.7937	17.7277	18.2157	20.8654	22.8596	26.0264	(46)

Water storage loss:

Total storage loss

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

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

226.9191	200.8595	213.6353	188.1943	182.7270	164.9565	162.9169	169.1439	170.7529	190.0617	201.7125	224.4682	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

226.9191	200.8595	213.6353	188.1943	182.7270	164.9565	162.9169	169.1439	170.7529	190.0617	201.7125	224.4682	(64)

Total per year (kWh/year) = Sum(64)m = 2296.3477 (64)

12Total per year (kWh/year) 2296 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

71.2465	62.9885	66.8296	58.5061	56.5526	50.7795	49.9658	52.0362	52.7069	58.9914	63.0009	70.4316	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.4551	87.9682	79.4551	82.1036	79.4551	82.1036	79.4551	79.4551	82.1036	79.4551	82.1036	79.4551	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.2172	158.8486	154.7374	145.9853	134.9374	124.5538	117.6170	115.9856	120.0967	128.8488	139.8968	150.2803	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	(71)
Water heating gains (Table 5)	95.7614	93.7329	89.8248	81.2585	76.0116	70.5271	67.1583	69.9412	73.2040	79.2895	87.5013	94.6661	(72)
Total internal gains	385.4876	393.6035	377.0712	362.4013	343.4579	327.2385	314.2843	315.4357	325.4582	340.6473	362.5556	377.4554	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(77)
Southwest	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(79)

Solar gains 70.0077	119.2489	163.1616	202.1651	226.4418	224.8043	216.7353	198.6238	176.6695	131.7955	83.8530	59.9120	(83)

Total gains	455.4952	512.8525	540.2328	564.5664	569.8997	552.0428	531.0196	514.0596	502.1277	472.4428	446.4086	437.3674	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.3562	71.5466	71.7379	72.7104	72.9081	73.9128	73.9128	74.1171	73.5076	72.9081	72.5138	72.1238	
alpha	5.7571	5.7698	5.7825	5.8474	5.8605	5.9275	5.9275	5.9411	5.9005	5.8605	5.8343	5.8083	
util living area													
	0.9887	0.9768	0.9544	0.8921	0.7688	0.5760	0.4178	0.4493	0.6713	0.9007	0.9752	0.9908	(86)
MIT	20.1261	20.2991	20.5053	20.7551	20.9197	20.9880	20.9984	20.9977	20.9711	20.7772	20.4193	20.0979	(87)
Th 2	20.1057	20.1079	20.1101	20.1209	20.1231	20.1340	20.1340	20.1362	20.1297	20.1231	20.1188	20.1144	(88)
util rest of house													
	0.9854	0.9702	0.9414	0.8632	0.7155	0.5027	0.3364	0.3661	0.5975	0.8681	0.9670	0.9881	(89)
MIT 2	19.1040	19.3227	19.5794	19.8831	20.0589	20.1274	20.1335	20.1354	20.1118	19.9155	19.4842	19.0751	(90)
Living area fraction										fLA = Living area / (4) =		0.5222	(91)
MIT	19.6378	19.8326	20.0629	20.3385	20.5084	20.5768	20.5852	20.5857	20.5605	20.3655	19.9725	19.6092	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4878	19.6826	19.9129	20.1885	20.3584	20.4268	20.4352	20.4357	20.4105	20.2155	19.8225	19.4592	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9824	0.9663	0.9381	0.8656	0.7306	0.5279	0.3648	0.3951	0.6221	0.8719	0.9636	0.9854	(94)
Useful gains	447.4739	495.5684	506.7754	488.7033	416.3632	291.4253	193.7234	203.1167	312.3739	411.9443	430.1514	431.0013	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	795.9492	772.6539	699.1929	580.5789	444.1042	294.8033	194.0390	203.6191	321.0377	493.1950	656.1080	791.1814	(97)
Space heating kWh													
	259.2656	186.2014	143.1586	66.1505	20.6393	0.0000	0.0000	0.0000	0.0000	60.4506	162.6887	267.9740	(98a)
Space heating requirement - total per year (kWh/year)												1166.5288	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	259.2656	186.2014	143.1586	66.1505	20.6393	0.0000	0.0000	0.0000	0.0000	60.4506	162.6887	267.9740	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.5288	
Space heating per m2											(98c) / (4) =	21.6626	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	259.2656	186.2014	143.1586	66.1505	20.6393	0.0000	0.0000	0.0000	0.0000	60.4506	162.6887	267.9740	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	289.6823	208.0463	159.9538	73.9111	23.0607	0.0000	0.0000	0.0000	0.0000	67.5426	181.7751	299.4123	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	226.9191	200.8595	213.6353	188.1943	182.7270	164.9565	162.9169	169.1439	170.7529	190.0617	201.7125	224.4682	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	196.6036	172.9967	181.7613	155.1723	147.2269	129.2083	125.0927	132.0502	135.6848	155.4221	170.2764	193.8652	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.5104	57.3642	63.5104	61.4617	63.5104	61.4617	63.5104	63.5104	61.4617	63.5104	61.4617	63.5104	(231)
Lighting	16.5092	13.2443	11.9250	8.7368	6.7485	5.5136	6.1562	8.0021	10.3940	13.6374	15.4035	16.9680	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1303.3841	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												1895.3606	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	106.7839	(230a)
central heating pump	41.0000	(230c)

maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	747.7839	(231)
Electricity for lighting (calculated in Appendix L)	133.2388	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4079.7673	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1303.3841	0.2100	273.7107	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1895.3606	0.2100	398.0257	(264)
Space and water heating			671.7364	(265)
Pumps, fans and electric keep-hot	747.7839	0.1387	103.7268	(267)
Energy for lighting	133.2388	0.1443	19.2305	(268)
Total CO2, kg/year			794.6937	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.7600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1303.3841	1.1300	1472.8241	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1895.3606	1.1300	2141.7574	(278)
Space and water heating			3614.5815	(279)
Pumps, fans and electric keep-hot	747.7839	1.5128	1131.2475	(281)
Energy for lighting	133.2388	1.5338	204.3660	(282)
Total Primary energy kWh/year			4950.1950	(286)
Dwelling Primary energy Rate (DPER)			91.9300	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		53.8500 (1b)	x	2.7000 (2b)	=	145.3950	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	145.3950	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1376	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3876	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3004	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3830	0.3754	0.3679	0.3304	0.3229	0.2853	0.2853	0.2778	0.3004	0.3229	0.3379	0.3529	(22b)
Effective ac	0.5733	0.5705	0.5677	0.5546	0.5521	0.5407	0.5407	0.5386	0.5451	0.5521	0.5571	0.5623	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.6200	1.1450	9.8702			(27)
EXPOSED FLOOR			27.4000	0.1300	3.5620			(28b)
Ext floor			10.3500	0.1300	1.3455			(28b)
External Wall 1	32.4000	11.2600	21.1400	0.1800	3.8052			(29a)
Exposed Internal Wall	27.0000	2.2000	24.8000	0.1800	4.4640			(29a)
Total net area of external elements Aum(A, m2)			97.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8869			(33)
Main dwelling								
Party Wall 1			27.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.7000	0.0700	0.6090
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	12.1000	0.0200	0.2420
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.3000	0.0000	0.0000
E25 Staggered party wall between dwellings	10.8000	0.0600	0.6480
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E20 Exposed floor (normal)	12.2500	0.3200	3.9200
P8 Party Wall - Exposed floor (inverted)	24.0000	0.2400	5.7600
E24 Eaves (insulation at ceiling level - inverted)	3.7000	0.2400	0.8880
E2 Other lintels (including other steel lintels)	7.4000	0.0500	0.3700
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	30.8000	0.0500	1.5400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.4800 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.3669 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.5084	27.3718	27.2379	26.6089	26.4912	25.9434	25.9434	25.8420	26.1544	26.4912	26.7293	26.9782	(38)
Heat transfer coeff	69.8754	69.7387	69.6048	68.9758	68.8582	68.3103	68.3103	68.2089	68.5213	68.8582	69.0962	69.3451	(39)
Average = Sum(39)m / 12 =												68.9753	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2976	1.2951	1.2926	1.2809	1.2787	1.2685	1.2685	1.2666	1.2724	1.2787	1.2831	1.2877	(40)
HLP (average)												1.2809	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8036 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	54.4598	53.6414	52.4488	50.1670	48.4830	46.6051	45.5377	46.7213	48.0187	50.0350	52.3659	54.2512	(42a)
Hot water usage for baths	23.5427	23.1931	22.7007	21.7929	21.1131	20.3593	19.9522	20.4411	20.9735	21.7800	22.7066	23.4631	(42b)
Hot water usage for other uses	33.1006	31.8969	30.6933	29.4896	28.2859	27.0823	27.0823	28.2859	29.4896	30.6933	31.8969	33.1006	(42c)
Average daily hot water use (litres/day)												102.1294	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.1031	108.7314	105.8428	101.4494	97.8821	94.0467	92.5722	95.4483	98.4818	102.5083	106.9693	110.8149	(44)
Energy conte	175.9602	154.8321	162.6764	138.8792	131.7681	115.6414	111.9580	118.1850	121.4379	139.1028	152.3974	173.5093	(45)
Energy content (annual)										Total = Sum(45)m =		1696.3477	
Distribution loss (46)m = 0.15 x (45)m	26.3940	23.2248	24.4015	20.8319	19.7652	17.3462	16.7937	17.7277	18.2157	20.8654	22.8596	26.0264	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.8796	46.3792	47.1738	48.6394	48.5663	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	226.9191	200.8595	213.6353	188.1943	181.6477	162.0206	159.1318	166.8244	170.0042	190.0617	201.7125	224.4682	(62)
WWHRS	-24.8968	-22.0189	-23.0569	-19.0920	-17.7931	-15.2257	-14.2716	-15.1765	-15.7531	-18.5711	-21.0388	-24.4357	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.0223	178.8406	190.5784	169.1022	163.8546	146.7949	144.8601	151.6479	154.2511	171.4905	180.6736	200.0325	(64)
										Total per year (kWh/year) = Sum(64)m =		2054.1490	(64)
12Total per year (kWh/year)												2054	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	71.2465	62.9885	66.8296	58.5061	56.2828	50.0456	49.0195	51.4564	52.5197	58.9914	63.0009	70.4316	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.7224	91.5856	82.7224	85.4798	82.7224	85.4798	82.7224	82.7224	85.4798	82.7224	85.4798	82.7224	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.2172	158.8486	154.7374	145.9853	134.9374	124.5538	117.6170	115.9856	120.0967	128.8488	139.8968	150.2803	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	(71)
Water heating gains (Table 5)	95.7614	93.7329	89.8248	81.2585	75.6489	69.5077	65.8864	69.1618	72.9440	79.2895	87.5013	94.6661	(72)
Total internal gains	388.7549	397.2209	380.3385	365.7775	346.3626	329.5953	316.2797	317.9236	328.5744	343.9146	365.9318	380.7227	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.9600	36.7938	0.6300	0.7000	0.7700	78.2629	(77)
Southwest	1.6600	36.7938	0.6300	0.7000	0.7700	18.6662	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	96.9291	165.1061	225.9054	279.9077	313.5199	311.2527	300.0808	275.0046	244.6077	182.4774	116.0987	82.9511	(83)
Total gains	485.6840	562.3270	606.2439	645.6852	659.8825	640.8480	616.3605	592.9283	573.1821	526.3920	482.0305	463.6738	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.5179	53.6228	53.7259	54.2158	54.3085	54.7440	54.7440	54.8255	54.5754	54.3085	54.1214	53.9271	
alpha	4.5679	4.5749	4.5817	4.6144	4.6206	4.6496	4.6496	4.6550	4.6384	4.6206	4.6081	4.5951	
util living area	0.9893	0.9784	0.9590	0.9093	0.8095	0.6408	0.4786	0.5159	0.7356	0.9223	0.9788	0.9912	(86)
MIT	19.6693	19.8895	20.1698	20.5188	20.7935	20.9483	20.9892	20.9847	20.9003	20.5514	20.0503	19.6302	(87)
Th 2	19.8427	19.8447	19.8467	19.8558	19.8576	19.8656	19.8656	19.8671	19.8625	19.8576	19.8541	19.8504	(88)
util rest of house	0.9858	0.9717	0.9458	0.8799	0.7502	0.5438	0.3599	0.3955	0.6455	0.8908	0.9709	0.9884	(89)
MIT 2	18.3322	18.6108	18.9614	19.3879	19.6912	19.8376	19.8624	19.8621	19.8004	19.4369	18.8235	18.2881	(90)
Living area fraction										fLA = Living area / (4) =		0.5222	(91)
MIT	19.0304	19.2786	19.5924	19.9784	20.2668	20.4176	20.4508	20.4483	20.3748	20.0189	19.4641	18.9889	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0304	19.2786	19.5924	19.9784	20.2668	20.4176	20.4508	20.4483	20.3748	20.0189	19.4641	18.9889	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9826	0.9676	0.9423	0.8835	0.7731	0.5927	0.4221	0.4585	0.6886	0.8960	0.9675	0.9856	(94)
Useful gains	477.2542	544.0845	571.2933	570.4566	510.1738	379.8551	260.1481	271.8674	394.6688	471.6562	466.3658	456.9763	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1029.2926	1002.7420	911.2923	764.1452	589.8929	397.4017	263.0488	276.1308	429.9558	648.5695	854.3139	1025.5381	(97)
Space heating kWh	410.7166	308.2179	252.9593	139.4558	59.3110	0.0000	0.0000	0.0000	0.0000	131.6235	279.3226	423.0099	(98a)
Space heating requirement - total per year (kWh/year)												2004.6165	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	410.7166	308.2179	252.9593	139.4558	59.3110	0.0000	0.0000	0.0000	0.0000	131.6235	279.3226	423.0099	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2004.6165	
Space heating per m2										(98c) / (4) =		37.2259	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.4000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	410.7166	308.2179	252.9593	139.4558	59.3110	0.0000	0.0000	0.0000	0.0000	131.6235	279.3226	423.0099	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	444.4985	333.5691	273.7654	150.9262	64.1894	0.0000	0.0000	0.0000	0.0000	142.4497	302.2972	457.8030	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	202.0223	178.8406	190.5784	169.1022	163.8546	146.7949	144.8601	151.6479	154.2511	171.4905	180.6736	200.0325	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.8679	85.5363	84.9890	83.9714	82.4190	80.3000	80.3000	80.3000	80.3000	83.8211	85.3114	85.9448	(217)
Fuel for water heating, kWh/month	235.2710	209.0815	224.2389	201.3808	198.8068	182.8081	180.3987	188.8517	192.0936	204.5912	211.7815	232.7453	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	17.1881	13.7889	12.4154	9.0961	7.0261	5.7403	6.4094	8.3312	10.8214	14.1982	16.0369	17.6658	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.5049	-27.0284	-40.2431	-46.9389	-52.1076	-49.2101	-48.6375	-45.1950	-39.3463	-31.6850	-20.6860	-15.8929	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.7774	-16.6088	-33.4666	-50.9250	-67.9661	-68.4940	-67.6585	-56.9724	-41.3674	-23.9362	-10.4457	-6.1296	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2169.4984	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2462.0491	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	138.7177	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-887.2237	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3969.0415	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2169.4984	0.2100	455.5947	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2462.0491	0.2100	517.0303	(264)
Space and water heating			972.6250	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	138.7177	0.1443	20.0213	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-435.4757	0.1338	-58.2779	
PV Unit electricity exported	-451.7480	0.1255	-56.7057	
Total			-114.9836	(269)
Total CO2, kg/year			889.5919	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2169.4984	1.1300	2451.5332	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2462.0491	1.1300	2782.1155	(278)
Space and water heating			5233.6487	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	138.7177	1.5338	212.7699	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-435.4757	1.4946	-650.8420	
PV Unit electricity exported	-451.7480	0.4607	-208.1415	
Total			-858.9836	(283)
Total Primary energy kWh/year			4717.5358	(286)
Target Primary Energy Rate (TPER)			87.6100	(287)

Full SAP Calculation Printout

Property Reference	FLAT 14	**Issued on Date**	17/06/2025
Assessment Reference	Flat 14	**Prop Type Ref**	
Property			

SAP Rating	78 C	**DER**	17.64	**TER**	18.84
Environmental	88 B	**% DER < TER**			6.37
CO_2 Emissions (t/year)	0.8	**DFEE**	53.17	**TFEE**	52.66
Compliance Check	See BREL	**% DFEE < TFEE**			-0.96
% DPER < TPER	-7.78	**DPER**	107.95	**TPER**	100.15

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.1600	(1b)	x 2.7000	(2b) =	138.1320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.1600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	138.1320	(5)

---

2. Ventilation rate

---

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			11.2200	0.8687	9.7471			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
Doors			2.2000	0.9000	1.9800			(26)
EXPOSED FLOOR			13.4100	0.0900	1.2069			(28b)
EXT floor			5.2800	0.0900	0.4752			(28a)
External Wall 1	61.0200	13.8600	47.1600	0.1200	5.6592			(29a)
Exposed Internal Wall	5.0000	2.2000	2.8000	0.1200	0.3360			(29a)
External Roof 1	61.0000		61.0000	0.1000	6.1000			(30)
Total net area of external elements Aum(A, m2)			145.7100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8804			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.0800	0.4560
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E20 Exposed floor (normal)	18.7500	0.3200	6.0000
P7 Party Wall - Exposed floor (normal)	7.8000	0.1600	1.2480
E24 Eaves (insulation at ceiling level - inverted)	5.9500	0.2400	1.4280
E14 Flat roof	5.7000	0.0800	0.4560
E10 Eaves (insulation at ceiling level)	10.7000	0.1200	1.2840
E12 Gable (insulation at ceiling level)	6.2000	0.4800	2.9760
E2 Other lintels (including other steel lintels)	7.3000	0.2000	1.4600
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	30.8000	0.0500	1.5400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.2130 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.0934 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0625	12.9172	12.7719	12.0455	11.9002	11.1737	11.1737	11.0284	11.4643	11.9002	12.1908	12.4813	(38)
Heat transfer coeff	59.1559	59.0106	58.8653	58.1389	57.9936	57.2671	57.2671	57.1218	57.5577	57.9936	58.2842	58.5748	(39)

Average = Sum(39)m / 12 = 58.1025

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1563	1.1535	1.1506	1.1364	1.1336	1.1194	1.1194	1.1165	1.1251	1.1336	1.1393	1.1449	(40)
HLP (average)												1.1357	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7243 (42)

Hot water usage for mixer showers

53.1302	52.3317	51.1682	48.9421	47.2993	45.4672	44.4259	45.5806	46.8463	48.8134	51.0873	52.9266	(42a)

Hot water usage for baths

22.9709	22.6298	22.1494	21.2636	20.6003	19.8649	19.4676	19.9446	20.4641	21.2510	22.1551	22.8933	(42b)

Hot water usage for other uses

32.2885	31.1143	29.9402	28.7661	27.5920	26.4178	26.4178	27.5920	28.7661	29.9402	31.1143	32.2885	(42c)

Average daily hot water use (litres/day) 99.6351 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.3896	106.0758	103.2578	98.9718	95.4916	91.7499	90.3113	93.1172	96.0765	100.0046	104.3567	108.1083	(44)
Energy conte	171.6626	151.0506	158.7034	135.4874	128.5500	112.8172	109.2237	115.2985	118.4719	135.7053	148.6753	169.2715	(45)

Energy content (annual) Total = Sum(45)m = 1654.9174

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

25.7494	22.6576	23.8055	20.3231	19.2825	16.9226	16.3836	17.2948	17.7708	20.3558	22.3013	25.3907	(46)

Water storage loss:

Total storage loss

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

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

222.6215	197.0780	209.6623	184.8025	179.5089	162.1323	160.1826	166.2574	167.7869	186.6642	197.9904	220.2304	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

222.6215	197.0780	209.6623	184.8025	179.5089	162.1323	160.1826	166.2574	167.7869	186.6642	197.9904	220.2304	(64)

Total per year (kWh/year) = Sum(64)m = 2254.9174 (64)

12Total per year (kWh/year) 2255 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

69.8175	61.7312	65.5086	57.3783	55.4826	49.8405	49.0566	51.0765	51.7207	57.8618	61.7633	69.0225	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.8159	83.9391	75.8159	78.3431	75.8159	78.3431	75.8159	75.8159	78.3431	75.8159	78.3431	75.8159	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.2462	151.8053	147.8764	139.5124	128.9543	119.0311	112.4019	110.8428	114.7716	123.1357	133.6938	143.6169	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	(71)
Water heating gains (Table 5)	93.8408	91.8619	88.0492	79.6921	74.5734	69.2229	65.9363	68.6512	71.8343	77.7712	85.7824	92.7722	(72)
Total internal gains	371.7672	379.4705	363.6059	349.4120	331.2079	315.4615	303.0185	304.1742	313.8134	328.5871	349.6836	364.0694	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9800	11.2829	0.3000	0.8000	0.7700	3.7156	(75)
Southeast	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(77)
Northwest	3.0800	11.2829	0.3000	0.8000	0.7700	5.7799	(81)

Solar gains	47.1919	83.5393	122.6798	166.0484	198.8051	203.0052	193.3725	168.0726	137.5627	94.5876	57.0994	40.0148	(83)
Total gains	418.9591	463.0098	486.2857	515.4603	530.0130	518.4667	496.3910	472.2469	451.3761	423.1747	406.7830	404.0842	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.0578	60.2057	60.3543	61.1085	61.2616	62.0388	62.0388	62.1966	61.7255	61.2616	60.9561	60.6537	
alpha	5.0039	5.0137	5.0236	5.0739	5.0841	5.1359	5.1359	5.1464	5.1150	5.0841	5.0637	5.0436	
util living area	0.9921	0.9859	0.9736	0.9350	0.8428	0.6673	0.4998	0.5440	0.7787	0.9443	0.9846	0.9934	(86)
MIT	19.8023	19.9664	20.2037	20.5347	20.8053	20.9567	20.9918	20.9876	20.9039	20.5723	20.1400	19.7780	(87)
Th 2	19.9551	19.9574	19.9597	19.9712	19.9735	19.9850	19.9850	19.9874	19.9804	19.9735	19.9689	19.9643	(88)
util rest of house	0.9896	0.9814	0.9649	0.9129	0.7914	0.5774	0.3886	0.4306	0.6979	0.9207	0.9788	0.9912	(89)
MIT 2	18.5814	18.7908	19.0911	19.5046	19.8108	19.9606	19.9825	19.9831	19.9171	19.5583	19.0209	18.5572	(90)
Living area fraction										fLA = Living area / (4) =		0.4527	(91)
MIT	19.1341	19.3230	19.5948	19.9709	20.2610	20.4115	20.4394	20.4378	20.3638	20.0173	19.5275	19.1099	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9841	19.1730	19.4448	19.8209	20.1110	20.2615	20.2894	20.2878	20.2138	19.8673	19.3775	18.9599	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9864	0.9769	0.9594	0.9090	0.7991	0.6031	0.4226	0.4651	0.7181	0.9177	0.9745	0.9884	(94)
Useful gains	413.2426	452.3370	466.5379	468.5558	423.5330	312.6741	209.7645	219.6333	324.1343	388.3540	396.3928	399.3930	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	868.6520	842.2593	761.9978	634.9285	487.7852	324.2201	211.2820	222.0797	351.8960	537.4434	715.5851	864.5559	(97)
Space heating kWh	338.8246	262.0278	219.8222	119.7883	47.8036	0.0000	0.0000	0.0000	0.0000	110.9225	229.8185	346.0812	(98a)
Space heating requirement - total per year (kWh/year)												1675.0887	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	338.8246	262.0278	219.8222	119.7883	47.8036	0.0000	0.0000	0.0000	0.0000	110.9225	229.8185	346.0812	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1675.0887	
Space heating per m2											(98c) / (4) =	32.7422	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	338.8246	262.0278	219.8222	119.7883	47.8036	0.0000	0.0000	0.0000	0.0000	110.9225	229.8185	346.0812	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	378.5750	292.7685	245.6114	133.8417	53.4119	0.0000	0.0000	0.0000	0.0000	123.9358	256.7804	386.6829	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	222.6215	197.0780	209.6623	184.8025	179.5089	162.1323	160.1826	166.2574	167.7869	186.6642	197.9904	220.2304	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	191.8018	168.7716	177.3223	151.3826	143.6313	126.0528	122.0376	128.8251	132.3708	151.6261	166.1176	189.1302	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.0574	56.9550	63.0574	61.0233	63.0574	61.0233	63.0574	63.0574	61.0233	63.0574	61.0233	63.0574	(231)
Lighting	15.7531	12.6377	11.3788	8.3366	6.4394	5.2611	5.8743	7.6356	9.9179	13.0128	14.6980	16.1909	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1871.6075	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	1849.0697	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)
mechanical ventilation fans (SFP = 0.6020) 101.4497 (230a)

central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	742.4497	(231)
Electricity for lighting (calculated in Appendix L)	127.1362	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4590.2630	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1871.6075	0.2100	393.0376	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1849.0697	0.2100	388.3046	(264)
Space and water heating			781.3422	(265)
Pumps, fans and electric keep-hot	742.4497	0.1387	102.9869	(267)
Energy for lighting	127.1362	0.1443	18.3497	(268)
Total CO2, kg/year			902.6788	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.6400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1871.6075	1.1300	2114.9164	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1849.0697	1.1300	2089.4488	(278)
Space and water heating			4204.3652	(279)
Pumps, fans and electric keep-hot	742.4497	1.5128	1123.1779	(281)
Energy for lighting	127.1362	1.5338	195.0057	(282)
Total Primary energy kWh/year			5522.5488	(286)
Dwelling Primary energy Rate (DPER)			107.9500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.1600	(1b) x	2.7000	(2b) =	138.1320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.1320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1448	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3948	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3356	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4279	0.4195	0.4111	0.3691	0.3607	0.3188	0.3188	0.3104	0.3356	0.3607	0.3775	0.3943	(22b)
Effective ac	0.5915	0.5880	0.5845	0.5681	0.5651	0.5508	0.5508	0.5482	0.5563	0.5651	0.5713	0.5777	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			7.9400	1.1450	9.0916			(27)
EXPOSED FLOOR			13.4100	0.1300	1.7433			(28b)
EXT floor			5.2800	0.1300	0.6864			(28a)
External Wall 1	61.0200	10.5800	50.4400	0.1800	9.0792			(29a)
Exposed Internal Wall	5.0000	2.2000	2.8000	0.1800	0.5040			(29a)
External Roof 1	61.0000		61.0000	0.1100	6.7100			(30)
Total net area of external elements Aum(A, m2)			145.7100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.6545			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.0200	0.1140
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E20 Exposed floor (normal)	18.7500	0.3200	6.0000
P7 Party Wall - Exposed floor (normal)	7.8000	0.1600	1.2480
E24 Eaves (insulation at ceiling level - inverted)	5.9500	0.2400	1.4280
E14 Flat roof	5.7000	0.0800	0.4560
E10 Eaves (insulation at ceiling level)	10.7000	0.0600	0.6420
E12 Gable (insulation at ceiling level)	6.2000	0.0600	0.3720
E2 Other lintels (including other steel lintels)	7.3000	0.0500	0.3650
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	30.8000	0.0500	1.5400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4730 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.1275 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9640	26.8020	26.6432	25.8973	25.7577	25.1081	25.1081	24.9878	25.3583	25.7577	26.0400	26.3352	(38)
Heat transfer coeff	73.0915	72.9295	72.7707	72.0248	71.8852	71.2356	71.2356	71.1153	71.4858	71.8852	72.1675	72.4627	(39)
Average = Sum(39)m / 12 =												72.0241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4287	1.4255	1.4224	1.4078	1.4051	1.3924	1.3924	1.3901	1.3973	1.4051	1.4106	1.4164	(40)
HLP (average)												1.4078	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7243 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.1302	52.3317	51.1682	48.9421	47.2993	45.4672	44.4259	45.5806	46.8463	48.8134	51.0873	52.9266	(42a)
Hot water usage for baths	22.9709	22.6298	22.1494	21.2636	20.6003	19.8649	19.4676	19.9446	20.4641	21.2510	22.1551	22.8933	(42b)
Hot water usage for other uses	32.2885	31.1143	29.9402	28.7661	27.5920	26.4178	26.4178	27.5920	28.7661	29.9402	31.1143	32.2885	(42c)
Average daily hot water use (litres/day)												99.6351	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.3896	106.0758	103.2578	98.9718	95.4916	91.7499	90.3113	93.1172	96.0765	100.0046	104.3567	108.1083	(44)
Energy conte	171.6626	151.0506	158.7034	135.4874	128.5500	112.8172	109.2237	115.2985	118.4719	135.7053	148.6753	169.2715	(45)
Energy content (annual)										Total = Sum(45)m =		1654.9174	
Distribution loss (46)m = 0.15 x (45)m	25.7494	22.6576	23.8055	20.3231	19.2825	16.9226	16.3836	17.2948	17.7708	20.3558	22.3013	25.3907	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.8080	48.6614	45.2465	46.0216	47.4515	47.3802	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	222.6215	197.0780	209.6623	184.2954	177.2114	158.0637	155.2453	162.7500	165.8520	186.6642	197.9904	220.2304	(62)
WWHRS	-24.2889	-21.4813	-22.4940	-18.6259	-17.3587	-14.8539	-13.9232	-14.8059	-15.3685	-18.1177	-20.5252	-23.8391	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	198.3326	175.5967	187.1683	165.6695	159.8528	143.2098	141.3221	147.9441	150.4836	168.5465	177.4652	196.3913	(64)
									Total per year (kWh/year) = Sum(64)m =			2011.9825	(64)
12Total per year (kWh/year)												2012	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	69.8175	61.7312	65.5086	57.2516	54.9082	48.8234	47.8223	50.1996	51.2369	57.8618	61.7633	69.0225	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.5464	88.0693	79.5464	82.1980	79.5464	82.1980	79.5464	79.5464	82.1980	79.5464	82.1980	79.5464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.2462	151.8053	147.8764	139.5124	128.9543	119.0311	112.4019	110.8428	114.7716	123.1357	133.6938	143.6169	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	(71)
Water heating gains (Table 5)	93.8408	91.8619	88.0492	79.5161	73.8014	67.8102	64.2773	67.4726	71.1624	77.7712	85.7824	92.7722	(72)
Total internal gains													

	375.4977	383.6007	367.3364	353.0908	334.1664	317.9037	305.0899	306.7262	316.9964	332.3176	353.5385	367.7999 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.4000	11.2829	0.6300	0.7000	0.7700	4.8275	(75)
Southeast	4.3600	36.7938	0.6300	0.7000	0.7700	49.0268	(77)
Northwest	2.1800	11.2829	0.6300	0.7000	0.7700	7.5171	(81)

Solar gains	61.3714	108.6385	159.5353	215.9276	258.5197	263.9796	251.4544	218.5582	178.8877	123.0053	74.2555	52.0379	(83)
Total gains	436.8691	492.2393	526.8717	569.0183	592.6861	581.8833	556.5443	525.2844	495.8841	455.3229	427.7940	419.8378	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6073	48.7152	48.8216	49.3272	49.4229	49.8736	49.8736	49.9580	49.6991	49.4229	49.2296	49.0291	
alpha	4.2405	4.2477	4.2548	4.2885	4.2949	4.3249	4.3249	4.3305	4.3133	4.2949	4.2820	4.2686	
util living area													
	0.9917	0.9854	0.9732	0.9377	0.8565	0.7023	0.5416	0.5899	0.8096	0.9499	0.9849	0.9930	(86)
MIT	19.4299	19.6251	19.9172	20.3237	20.6779	20.9052	20.9759	20.9654	20.8160	20.3691	19.8362	19.4004	(87)
Th 2	19.7414	19.7438	19.7462	19.7573	19.7594	19.7692	19.7692	19.7710	19.7654	19.7594	19.7552	19.7508	(88)
util rest of house													
	0.9890	0.9805	0.9638	0.9144	0.8018	0.5976	0.4007	0.4479	0.7219	0.9263	0.9790	0.9907	(89)
MIT 2	17.9590	18.2079	18.5777	19.0853	19.4919	19.7164	19.7621	19.7596	19.6444	19.1513	18.4859	17.9278	(90)
Living area fraction										fLA = Living area / (4) =		0.4527	(91)
MIT	18.6249	18.8495	19.1841	19.6459	20.0288	20.2546	20.3116	20.3054	20.1748	19.7026	19.0972	18.5944	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6249	18.8495	19.1841	19.6459	20.0288	20.2546	20.3116	20.3054	20.1748	19.7026	19.0972	18.5944	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9758	0.9583	0.9119	0.8152	0.6417	0.4649	0.5124	0.7544	0.9249	0.9747	0.9876	(94)
Useful gains	430.5509	480.3419	504.9080	518.8812	483.1691	373.3979	258.7402	269.1616	374.0788	421.1345	416.9589	414.6384	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1047.0256	1017.3273	923.0314	773.9720	598.7148	402.8069	264.3988	277.7349	434.2598	654.3426	865.8063	1043.0578	(97)
Space heating kWh													
	458.6572	360.8542	311.0839	183.6654	85.9660	0.0000	0.0000	0.0000	0.0000	173.5068	323.1702	467.5441	(98a)
Space heating requirement - total per year (kWh/year)												2364.4476	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	458.6572	360.8542	311.0839	183.6654	85.9660	0.0000	0.0000	0.0000	0.0000	173.5068	323.1702	467.5441	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2364.4476	
Space heating per m2											(98c) / (4) =	46.2167	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	458.6572	360.8542	311.0839	183.6654	85.9660	0.0000	0.0000	0.0000	0.0000	173.5068	323.1702	467.5441	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	496.3822	390.5348	336.6708	198.7720	93.0368	0.0000	0.0000	0.0000	0.0000	187.7779	349.7513	506.0001	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	198.3326	175.5967	187.1683	165.6695	159.8528	143.2098	141.3221	147.9441	150.4836	168.5465	177.4652	196.3913	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.1158	85.8890	85.4617	84.6030	83.1117	80.3000	80.3000	80.3000	80.3000	84.4437	85.6484	86.1702	(217)
Fuel for water heating, kWh/month													
	230.3092	204.4460	219.0083	195.8200	192.3348	178.3435	175.9927	184.2392	187.4017	199.5964	207.2019	227.9111	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.5282	13.2595	11.9387	8.7468	6.7563	5.5200	6.1633	8.0113	10.4059	13.6531	15.4212	16.9875	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.6135	-25.7438	-38.3570	-44.7735	-49.7375	-46.9887	-46.4474	-43.1468	-37.5393	-30.1996	-19.6975	-15.1258	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.3559	-15.7136	-31.6707	-48.2018	-64.3381	-64.8356	-64.0392	-53.9170	-39.1425	-22.6432	-9.8791	-5.7966	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

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

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

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

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

Annual totals kWh/year		
Space heating fuel - main system 1	2558.9260	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2402.6048	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	133.3918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-842.9037	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4338.0189	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2558.9260	0.2100	537.3745	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2402.6048	0.2100	504.5470	(264)
Space and water heating			1041.9215	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.3918	0.1443	19.2526	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-415.3703	0.1338	-55.5801	
PV Unit electricity exported	-427.5334	0.1255	-53.6646	
Total			-109.2447	(269)
Total CO2, kg/year			963.8586	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.8400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2558.9260	1.1300	2891.5864	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2402.6048	1.1300	2714.9434	(278)
Space and water heating			5606.5298	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.3918	1.5338	204.6009	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-415.3703	1.4945	-620.7666	
PV Unit electricity exported	-427.5334	0.4607	-196.9789	
Total			-817.7455	(283)
Total Primary energy kWh/year			5123.4859	(286)
Target Primary Energy Rate (TPER)			100.1500	(287)

Full SAP Calculation Printout

Property Reference	FLAT 15	**Issued on Date**	17/06/2025
Assessment Reference	Flat 15	**Prop Type Ref**	
Property			

SAP Rating	79 C	**DER**	15.72	**TER**	16.56
Environmental	89 B	**% DER < TER**			5.07
CO_2 Emissions (t/year)	0.71	**DFEE**	44.76	**TFEE**	42.06
Compliance Check	See BREL	**% DFEE < TFEE**			-6.41
% DPER < TPER	-11.24	**DPER**	97.71	**TPER**	87.84

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	136.5660	(5)

---

2. Ventilation rate

---

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			9.9000	0.8687	8.6004			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
Doors			1.5400	0.9000	1.3860			(26)
External Wall 1	52.2900	14.0800	38.2100	0.1200	4.5852			(29a)
Exposed Internal Wall	11.7000		11.7000	0.1200	1.4040			(29a)
External Roof 1	50.5900		50.5900	0.1000	5.0590			(30)
Total net area of external elements Aum(A, m2)			114.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4106			(33)
Main dwelling								
Party Wall 1			18.6300	0.0000	0.0000			(32)
Party Floor 1			50.5800					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	18.1000	0.0700	1.2670	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.6000	0.0800	0.4480	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000	
E25 Staggered party wall between dwellings	2.7000	0.0800	0.2160	
E16 Corner (normal)	8.1000	0.0900	0.7290	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E14 Flat roof	5.6000	0.0800	0.4480	
E10 Eaves (insulation at ceiling level)	8.7000	0.1200	1.0440	
E12 Gable (insulation at ceiling level)	9.4000	0.4800	4.5120	
P4 Party wall - Roof (insulation at ceiling level)	6.9000	0.2400	1.6560	
E2 Other lintels (including other steel lintels)	7.2000	0.2000	1.4400	
E3 Sill	4.9000	0.0400	0.1960	
E4 Jamb	27.6000	0.0500	1.3800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.0930 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.5036 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9144	12.7708	12.6271	11.9089	11.7652	11.0470	11.0470	10.9033	11.3343	11.7652	12.0525	12.3398	(38)
Heat transfer coeff	49.4180	49.2744	49.1307	48.4125	48.2688	47.5506	47.5506	47.4069	47.8379	48.2688	48.5561	48.8434	(39)
Average = Sum(39)m / 12 =												48.3766	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9770	0.9742	0.9713	0.9571	0.9543	0.9401	0.9401	0.9373	0.9458	0.9543	0.9600	0.9657	(40)
HLP (average)												0.9564	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)
Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(64)
										Total per year (kWh/year) = Sum(64)m =		2245.9825	(64)
12Total per year (kWh/year)												2246	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.5094	61.4600	65.2237	57.1351	55.2518	49.6380	48.8605	50.8695	51.5080	57.6181	61.4964	68.7186	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.7321	83.8463	75.7321	78.2566	75.7321	78.2566	75.7321	75.7321	78.2566	75.7321	78.2566	75.7321	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	93.4266	91.4583	87.6663	79.3543	74.2632	68.9416	65.6728	68.3730	71.5389	77.4437	85.4117	92.3638	(72)
Total internal gains	369.5068	377.1962	361.4005	347.3327	329.2649	313.6441	301.2880	302.4447	312.0245	326.6852	347.6298	361.8811	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.5400	36.7938	0.3000	0.8000	0.7700	9.4241	(77)
Southwest	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(79)
Northwest	6.1600	11.2829	0.3000	0.8000	0.7700	11.5597	(81)

Solar gains	34.4468	62.5154	95.7351	135.7153	167.6159	173.2672	164.1918	139.3433	109.4149	71.8427	41.9586	29.0269	(83)

Total gains	403.9536	439.7115	457.1356	483.0480	496.8808	486.9112	465.4798	441.7880	421.4394	398.5279	389.5884	390.9080	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.0773	71.2845	71.4929	72.5536	72.7695	73.8687	73.8687	74.0925	73.4251	72.7695	72.3390	71.9135	
alpha	5.7385	5.7523	5.7662	5.8369	5.8513	5.9246	5.9246	5.9395	5.8950	5.8513	5.8226	5.7942	
util living area													
	0.9915	0.9848	0.9708	0.9223	0.8074	0.6100	0.4473	0.4898	0.7339	0.9328	0.9823	0.9928	(86)
MIT	20.0705	20.2111	20.4116	20.6919	20.8951	20.9838	20.9978	20.9963	20.9542	20.7137	20.3585	20.0516	(87)
Th 2	20.1025	20.1049	20.1073	20.1192	20.1216	20.1335	20.1335	20.1359	20.1288	20.1216	20.1168	20.1120	(88)
util rest of house													
	0.9889	0.9802	0.9618	0.8988	0.7566	0.5338	0.3604	0.3998	0.6594	0.9075	0.9762	0.9906	(89)
MIT 2	19.0314	19.2109	19.4639	19.8120	20.0354	20.1245	20.1328	20.1346	20.0991	19.8454	19.4077	19.0147	(90)
Living area fraction										fLA = Living area / (4) =		0.5042	(91)
MIT	19.5552	19.7152	19.9417	20.2556	20.4688	20.5577	20.5689	20.5690	20.5302	20.2832	19.8870	19.5375	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4052	19.5652	19.7917	20.1056	20.3188	20.4077	20.4189	20.4190	20.3802	20.1332	19.7370	19.3875	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9767	0.9579	0.8984	0.7688	0.5585	0.3892	0.4296	0.6820	0.9079	0.9729	0.9883	(94)
Useful gains	398.3992	429.4705	437.8711	433.9636	381.9982	271.9251	181.1704	189.7944	287.4417	361.8041	379.0121	386.3314	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	746.4708	722.6166	653.0293	542.4913	416.0202	276.1613	181.5902	190.5302	300.4316	460.1542	613.6052	741.8082	(97)
Space heating kWh													
	258.9653	196.9941	160.0777	78.1399	25.3124	0.0000	0.0000	0.0000	0.0000	73.1725	168.9070	264.4747	(98a)
Space heating requirement - total per year (kWh/year)												1226.0436	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	258.9653	196.9941	160.0777	78.1399	25.3124	0.0000	0.0000	0.0000	0.0000	73.1725	168.9070	264.4747	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1226.0436	
Space heating per m2											(98c) / (4) =	24.2397	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	258.9653	196.9941	160.0777	78.1399	25.3124	0.0000	0.0000	0.0000	0.0000	73.1725	168.9070	264.4747	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	289.3467	220.1052	178.8577	87.3072	28.2820	0.0000	0.0000	0.0000	0.0000	81.7570	188.7229	295.5025	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	190.7662	167.8604	176.3649	150.5653	142.8558	125.3722	121.3788	128.1296	131.6561	150.8074	165.2207	188.1091	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	62.9597	56.8668	62.9597	60.9287	62.9597	60.9287	62.9597	62.9597	60.9287	62.9597	60.9287	62.9597	(231)
Lighting	15.7356	12.6237	11.3663	8.3274	6.4323	5.2553	5.8678	7.6272	9.9069	12.9984	14.6817	16.1730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1369.8811	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												1839.0866	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)													
mechanical ventilation fans (SFP = 0.6020)												100.2995	(230a)
central heating pump												41.0000	(230c)

maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	741.2995	(231)
Electricity for lighting (calculated in Appendix L)	126.9957	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4077.2628	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1369.8811	0.2100	287.6750	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1839.0866	0.2100	386.2082	(264)
Space and water heating			673.8832	(265)
Pumps, fans and electric keep-hot	741.2995	0.1387	102.8274	(267)
Energy for lighting	126.9957	0.1443	18.3294	(268)
Total CO2, kg/year			795.0400	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.7200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1369.8811	1.1300	1547.9656	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1839.0866	1.1300	2078.1678	(278)
Space and water heating			3626.1334	(279)
Pumps, fans and electric keep-hot	741.2995	1.5128	1121.4379	(281)
Energy for lighting	126.9957	1.5338	194.7902	(282)
Total Primary energy kWh/year			4942.3616	(286)
Dwelling Primary energy Rate (DPER)			97.7100	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		50.5800 (1b)	x	2.7000 (2b)	=	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.5660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1464	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3964	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3370	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4297	0.4212	0.4128	0.3707	0.3623	0.3201	0.3201	0.3117	0.3370	0.3623	0.3791	0.3960	(22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5568	0.5656	0.5719	0.5784	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1800	1.0000	4.1800			(26)
TER Opening Type			8.4700	1.1450	9.6985			(27)
External Wall 1	52.2900	12.6500	39.6400	0.1800	7.1352			(29a)
Exposed Internal Wall	11.7000		11.7000	0.1800	2.1060			(29a)
External Roof 1	50.5900		50.5900	0.1100	5.5649			(30)
Total net area of external elements Aum(A, m2)			114.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.6846			(33)
Main dwelling								
Party Wall 1			18.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	18.1000	0.0700	1.2670
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.6000	0.0200	0.1120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000
E25 Staggered party wall between dwellings	2.7000	0.0600	0.1620
E16 Corner (normal)	8.1000	0.0900	0.7290
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E14 Flat roof	5.6000	0.0800	0.4480
E10 Eaves (insulation at ceiling level)	8.7000	0.0600	0.5220
E12 Gable (insulation at ceiling level)	9.4000	0.0600	0.5640
P4 Party wall - Roof (insulation at ceiling level)	6.9000	0.1200	0.8280
E2 Other lintels (including other steel lintels)	7.2000	0.0500	0.3600
E3 Sill	4.9000	0.0500	0.2450
E4 Jamb	27.6000	0.0500	1.3800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3740 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.0586 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.6931	26.5315	26.3732	25.6296	25.4904	24.8427	24.8427	24.7228	25.0922	25.4904	25.7719	26.0662	(38)
Heat transfer coeff	61.7516	61.5901	61.4318	60.6881	60.5490	59.9013	59.9013	59.7814	60.1508	60.5490	60.8305	61.1247	(39)
Average = Sum(39)m / 12 =												60.6875	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2209	1.2177	1.2145	1.1998	1.1971	1.1843	1.1843	1.1819	1.1892	1.1971	1.2027	1.2085	(40)
HLP (average)												1.1998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)

Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.5445	48.3987	45.0023	45.7732	47.1953	47.1244	50.6861	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	221.6946	196.2625	208.8055	183.3004	176.2547	157.2104	154.4072	161.8713	164.9566	185.6587	197.1876	219.3165	(62)
WWHRS	-24.1578	-21.3654	-22.3726	-18.5254	-17.2650	-14.7738	-13.8481	-14.7260	-15.2855	-18.0199	-20.4144	-23.7104	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.5368	174.8971	186.4329	164.7750	158.9897	142.4366	140.5591	147.1453	149.6711	167.6388	176.7732	195.6061	(64)
										Total per year (kWh/year) = Sum(64)m =		2002.4619	(64)
12Total per year (kWh/year)												2002	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.5094	61.4600	65.2237	56.9425	54.6118	48.5598	47.5641	49.9286	50.9603	57.5499	61.4964	68.7186	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.5893	85.9024	77.5893	80.1756	77.5893	80.1756	77.5893	77.5893	80.1756	77.5893	80.1756	77.5893	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	93.4266	91.4583	87.6663	79.0868	73.4029	67.4441	63.9302	67.1083	70.7782	77.3521	85.4117	92.3638	(72)
Total internal gains	371.3639	379.2523	363.2576	348.9842	330.2618	314.0656	301.4026	303.0372	313.1829	328.4506	349.5488	363.7383	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(77)
Southwest	1.8800	36.7938	0.6300	0.7000	0.7700	21.1400	(79)
Northwest	5.2700	11.2829	0.6300	0.7000	0.7700	18.1721	(81)

Solar gains	54.1550	98.2821	150.5066	213.3584	263.5080	272.3918	258.1247	219.0614	172.0122	112.9455	65.9645	45.6342 (83)
Total gains	425.5189	477.5343	513.7642	562.3426	593.7698	586.4574	559.5273	522.0986	485.1951	441.3961	415.5133	409.3724 (84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.8811	57.0303	57.1772	57.8779	58.0109	58.6381	58.6381	58.7558	58.3949	58.0109	57.7424	57.4645	
alpha	4.7921	4.8020	4.8118	4.8585	4.8674	4.9092	4.9092	4.9171	4.8930	4.8674	4.8495	4.8310	
util living area	0.9915	0.9843	0.9688	0.9190	0.8068	0.6231	0.4648	0.5158	0.7597	0.9394	0.9835	0.9929	(86)
MIT	19.7250	19.9080	20.1767	20.5431	20.8234	20.9622	20.9926	20.9880	20.9022	20.5481	20.0829	19.6989	(87)
Th 2	19.9033	19.9059	19.9084	19.9201	19.9223	19.9326	19.9326	19.9345	19.9286	19.9223	19.9179	19.9132	(88)
util rest of house	0.9888	0.9793	0.9585	0.8925	0.7493	0.5318	0.3553	0.4019	0.6746	0.9138	0.9774	0.9906	(89)
MIT 2	18.4460	18.6793	19.0180	19.4703	19.7796	19.9121	19.9304	19.9305	19.8658	19.4879	18.9115	18.4200	(90)
Living area fraction									fLA = Living area / (4) =			0.5042	(91)
MIT	19.0908	19.2988	19.6021	20.0112	20.3058	20.4415	20.4659	20.4636	20.3883	20.0224	19.5021	19.0648	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0908	19.2988	19.6021	20.0112	20.3058	20.4415	20.4659	20.4636	20.3883	20.0224	19.5021	19.0648	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9861	0.9757	0.9550	0.8951	0.7713	0.5766	0.4107	0.4595	0.7135	0.9166	0.9743	0.9882	(94)
Useful gains	419.6012	465.9360	490.6362	503.3304	457.9564	338.1758	229.7777	239.8784	346.2065	404.5752	404.8385	404.5477	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	913.3588	886.8225	804.8884	674.3161	521.0747	349.9158	231.5732	242.9300	378.2479	570.5162	754.4227	908.6046	(97)
Space heating kWh	367.3556	282.8357	233.8036	123.1097	46.9600	0.0000	0.0000	0.0000	0.0000	123.4601	251.7006	375.0183	(98a)
Space heating requirement - total per year (kWh/year)												1804.2437	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	367.3556	282.8357	233.8036	123.1097	46.9600	0.0000	0.0000	0.0000	0.0000	123.4601	251.7006	375.0183	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1804.2437	
Space heating per m2											(98c) / (4) =	35.6711	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.4000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	367.3556	282.8357	233.8036	123.1097	46.9600	0.0000	0.0000	0.0000	0.0000	123.4601	251.7006	375.0183	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	397.5710	306.0993	253.0342	133.2356	50.8225	0.0000	0.0000	0.0000	0.0000	133.6148	272.4033	405.8640	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	197.5368	174.8971	186.4329	164.7750	158.9897	142.4366	140.5591	147.1453	149.6711	167.6388	176.7732	195.6061	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.6908	85.4051	84.8677	83.7652	82.1112	80.3000	80.3000	80.3000	80.3000	83.7355	85.1382	85.7518	(217)
Fuel for water heating, kWh/month	230.5229	204.7854	219.6748	196.7105	193.6273	177.3806	175.0425	183.2444	186.3899	200.2004	207.6310	228.1072	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1215	12.9333	11.6450	8.5316	6.5901	5.3841	6.0117	7.8142	10.1499	13.3172	15.0417	16.5696	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.4172	-25.4595	-37.9386	-44.2931	-49.2126	-46.4973	-45.9613	-42.6897	-37.1346	-29.8682	-19.4786	-14.9569	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.2691	-15.5280	-31.2951	-47.6281	-63.5698	-64.0593	-63.2727	-53.2737	-38.6778	-22.3755	-9.7626	-5.7283	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1952.6447	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2403.3168	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.1099	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-833.3478	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3738.7236	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1952.6447	0.2100	410.0554	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2403.3168	0.2100	504.6965	(264)
Space and water heating			914.7519	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.1099	0.1443	18.7789	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-410.9076	0.1338	-54.9815	
PV Unit electricity exported	-422.4402	0.1255	-53.0259	
Total			-108.0074	(269)
Total CO2, kg/year			837.4527	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1952.6447	1.1300	2206.4885	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2403.3168	1.1300	2715.7480	(278)
Space and water heating			4922.2365	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.1099	1.5338	199.5669	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-410.9076	1.4945	-614.0916	
PV Unit electricity exported	-422.4402	0.4607	-194.6345	
Total			-808.7261	(283)
Total Primary energy kWh/year			4443.1781	(286)
Target Primary Energy Rate (TPER)			87.8400	(287)

Full SAP Calculation Printout

Property Reference	FLAT 16	**Issued on Date**	17/06/2025
Assessment Reference	Flat 16	**Prop Type Ref**	
Property			

SAP Rating	82 B	**DER**	12.38	**TER**	13.49
Environmental	90 B	**% DER < TER**			8.23
CO_2 Emissions (t/year)	0.84	**DFEE**	38.44	**TFEE**	38.43
Compliance Check	See BREL	**% DFEE < TFEE**			-0.02
% DPER < TPER	-7.22	**DPER**	76.25	**TPER**	71.11

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.6000 (1b)	x	2.7000 (2b)	=	209.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.5200	(5)

---

2. Ventilation rate

---

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			15.4000	0.8687	13.3784			(27)
OPAQUE			5.2800	0.9000	4.7520			(26)
Door			2.2000	0.9000	1.9800			(26)
External Wall 1	58.0000	20.6800	37.3200	0.1200	4.4784			(29a)
Exposed Internal Wall	11.4800	2.2000	9.2800	0.1200	1.1136			(29a)
External Roof 1	58.3000		58.3000	0.1000	5.8300			(30)
Flat roof	19.4000		19.4000	0.1000	1.9400			(30)
Total net area of external elements Aum(A, m2)			147.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.4724			(33)
Main dwelling								
Party Wall 1			18.6100	0.0000	0.0000			(32)
Party Floor 1			77.6900					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	13.5500	0.0700	0.9485	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.9300	0.0800	0.6344	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.1000	0.0000	0.0000	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E16 Corner (normal)	10.8000	0.0900	0.9720	
E17 Corner (inverted - internal area greater than external area)	8.1000	-0.0900	-0.7290	
E14 Flat roof	12.3700	0.0800	0.9896	
E10 Eaves (insulation at ceiling level)	8.7000	0.1200	1.0440	
E12 Gable (insulation at ceiling level)	1.4300	0.4800	0.6864	
P4 Party wall - Roof (insulation at ceiling level)	6.8900	0.2400	1.6536	
E24 Eaves (insulation at ceiling level - inverted)	6.2100	0.2400	1.4904	
E2 Other lintels (including other steel lintels)	10.4000	0.2000	2.0800	
E3 Sill	7.0000	0.0400	0.2800	
E4 Jamb	44.0000	0.0500	2.2000	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.0059	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	46.4783	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8134	19.5930	19.3726	18.2707	18.0503	16.9483	16.9483	16.7279	17.3891	18.0503	18.4911	18.9318	(38)
Heat transfer coeff	66.2917	66.0713	65.8509	64.7489	64.5286	63.4266	63.4266	63.2062	63.8674	64.5286	64.9693	65.4101	(39)
Average = Sum(39)m / 12 =												64.6938	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8543	0.8514	0.8486	0.8344	0.8316	0.8174	0.8174	0.8145	0.8230	0.8316	0.8372	0.8429	(40)
HLP (average)												0.8337	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4157 (42)
Hot water usage for mixer showers	64.7238	63.7511	62.3338	59.6219	57.6206	55.3887	54.1201	55.5268	57.0687	59.4651	62.2352	64.4758 (42a)
Hot water usage for baths	27.9566	27.5414	26.9567	25.8787	25.0714	24.1763	23.6929	24.2734	24.9056	25.8634	26.9636	27.8621 (42b)
Hot water usage for other uses	39.3696	37.9380	36.5064	35.0748	33.6432	32.2115	32.2115	33.6432	35.0748	36.5064	37.9380	39.3696 (42c)
Average daily hot water use (litres/day)												121.3839 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.0500	129.2305	125.7969	120.5753	116.3351	111.7766	110.0245	113.4434	117.0491	121.8348	127.1368	131.7075	(44)
Energy conte	209.1350	184.0226	193.3451	165.0616	156.6095	137.4424	133.0651	140.4666	144.3333	165.3287	181.1297	206.2222	(45)
Energy content (annual)										Total = Sum(45)m =		2016.1616	
Distribution loss (46)m = 0.15 x (45)m	31.3702	27.6034	29.0018	24.7592	23.4914	20.6164	19.9598	21.0700	21.6500	24.7993	27.1695	30.9333	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	260.0939	230.0500	244.3040	214.3766	207.5684	186.7574	184.0240	191.4255	193.6483	216.2876	230.4448	257.1811	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	260.0939	230.0500	244.3040	214.3766	207.5684	186.7574	184.0240	191.4255	193.6483	216.2876	230.4448	257.1811	(64)
										Total per year (kWh/year) = Sum(64)m =		2616.1616	(64)
12Total per year (kWh/year)												2616	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	82.2771	72.6944	77.0270	67.2117	64.8124	58.0283	56.9839	59.4449	60.3196	67.7115	72.5544	81.3086	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9676	120.6427	108.9676	112.5998	108.9676	112.5998	108.9676	108.9676	112.5998	108.9676	112.5998	108.9676	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.3515	216.5758	210.9707	199.0380	183.9750	169.8180	160.3603	158.1360	163.7411	175.6738	190.7368	204.8938	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	(71)
Water heating gains (Table 5)	110.5875	108.1761	103.5309	93.3496	87.1134	80.5949	76.5912	79.8990	83.7772	91.0101	100.7700	109.2857	(72)
Total internal gains	496.1428	507.6308	485.7053	467.2236	442.2922	422.2490	405.1553	406.2388	419.3543	437.8877	466.3428	485.3833	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(79)
Northwest	6.1600	11.2829	0.3000	0.8000	0.7700	11.5597	(81)

Solar gains	68.1044	119.8466	174.1782	232.9101	276.4821	281.3462	268.3915	234.8355	194.3522	135.2059	82.2726	57.8307	(83)
Total gains	564.2472	627.4774	659.8835	700.1337	718.7743	703.5951	673.5467	641.0743	613.7065	573.0936	548.6154	543.2140	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.2906	81.5617	81.8347	83.2274	83.5117	84.9626	84.9626	85.2588	84.3762	83.5117	82.9451	82.3862	
alpha	6.4194	6.4374	6.4556	6.5485	6.5674	6.6642	6.6642	6.6839	6.6251	6.5674	6.5297	6.4924	
util living area	0.9935	0.9860	0.9696	0.9110	0.7783	0.5706	0.4137	0.4523	0.6935	0.9257	0.9845	0.9948	(86)
MIT	20.2021	20.3499	20.5396	20.7865	20.9403	20.9934	20.9993	20.9988	20.9779	20.7939	20.4683	20.1827	(87)
Th 2	20.2065	20.2090	20.2114	20.2236	20.2261	20.2383	20.2383	20.2408	20.2334	20.2261	20.2212	20.2163	(88)
util rest of house	0.9915	0.9819	0.9606	0.8867	0.7297	0.5055	0.3424	0.3783	0.6261	0.9001	0.9792	0.9932	(89)
MIT 2	19.2791	19.4679	19.7069	20.0122	20.1777	20.2346	20.2381	20.2403	20.2193	20.0279	19.6286	19.2622	(90)
Living area fraction									fLA = Living area / (4) =			0.4086	(91)
MIT	19.6563	19.8283	20.0472	20.3286	20.4893	20.5447	20.5492	20.5503	20.5293	20.3409	19.9717	19.6384	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5063	19.6783	19.8972	20.1786	20.3393	20.3947	20.3992	20.4003	20.3793	20.1909	19.8217	19.4884	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9785	0.9563	0.8851	0.7372	0.5191	0.3575	0.3939	0.6394	0.8987	0.9757	0.9912	(94)
Useful gains	558.1754	613.9571	631.0612	619.6740	529.8729	365.2059	240.8036	252.5372	392.4107	515.0641	535.3099	538.4444	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1008.0498	976.4200	882.2151	730.2787	557.4847	367.5392	240.9676	252.8425	401.0421	618.8860	826.5212	1000.0152	(97)
Space heating kWh	334.7065	243.5751	186.8585	79.6353	20.5432	0.0000	0.0000	0.0000	0.0000	77.2435	209.6721	343.4087	(98a)
Space heating requirement - total per year (kWh/year)												1495.6430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.7065	243.5751	186.8585	79.6353	20.5432	0.0000	0.0000	0.0000	0.0000	77.2435	209.6721	343.4087	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1495.6430	
Space heating per m2											(98c) / (4) =	19.2738	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.7065	243.5751	186.8585	79.6353	20.5432	0.0000	0.0000	0.0000	0.0000	77.2435	209.6721	343.4087	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	373.9738	272.1509	208.7804	88.9780	22.9533	0.0000	0.0000	0.0000	0.0000	86.3056	234.2706	383.6968	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	260.0939	230.0500	244.3040	214.3766	207.5684	186.7574	184.0240	191.4255	193.6483	216.2876	230.4448	257.1811	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	233.6704	205.6118	216.0280	184.4263	174.9826	153.5669	148.6761	156.9459	161.2662	184.7248	202.3796	230.4158	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	67.5103	60.9771	67.5103	65.3326	67.5103	65.3326	67.5103	67.5103	65.3326	67.5103	65.3326	67.5103	(231)
Lighting	22.6413	18.1637	16.3544	11.9819	9.2552	7.5616	8.4429	10.9744	14.2547	18.7029	21.1249	23.2706	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1671.1095	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2252.6945	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020)	153.8799	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	794.8799	(231)
Electricity for lighting (calculated in Appendix L)	182.7284	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4901.4123	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1671.1095	0.2100	350.9330	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2252.6945	0.2100	473.0659	(264)
Space and water heating			823.9988	(265)
Pumps, fans and electric keep-hot	794.8799	0.1387	110.2596	(267)
Energy for lighting	182.7284	0.1443	26.3734	(268)
Total CO2, kg/year			960.6318	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1671.1095	1.1300	1888.3537	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2252.6945	1.1300	2545.5448	(278)
Space and water heating			4433.8985	(279)
Pumps, fans and electric keep-hot	794.8799	1.5128	1202.4943	(281)
Energy for lighting	182.7284	1.5338	280.2749	(282)
Total Primary energy kWh/year			5916.6677	(286)
Dwelling Primary energy Rate (DPER)			76.2500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.6000	(1b)	x 2.7000	(2b) =	209.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.5200	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3342	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3091	0.3342	0.3593	0.3760	0.3927	(22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5558	0.5645	0.5707	0.5771	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			7.4800	1.0000	7.4800			(26)
TER Opening Type			11.9200	1.1450	13.6489			(27)
External Wall 1	58.0000	17.2000	40.8000	0.1800	7.3440			(29a)
Exposed Internal Wall	11.4800	2.2000	9.2800	0.1800	1.6704			(29a)
External Roof 1	58.3000		58.3000	0.1100	6.4130			(30)
Flat roof	19.4000		19.4000	0.1100	2.1340			(30)
Total net area of external elements Aum(A, m2)			147.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6903			(33)
Main dwelling								
Party Wall 1			18.6100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	13.5500	0.0700	0.9485
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.9300	0.0200	0.1586
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.1000	0.0000	0.0000
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	8.1000	-0.0900	-0.7290
E14 Flat roof	12.3700	0.0800	0.9896
E10 Eaves (insulation at ceiling level)	8.7000	0.0600	0.5220
E12 Gable (insulation at ceiling level)	1.4300	0.0600	0.0858
P4 Party wall - Roof (insulation at ceiling level)	6.8900	0.1200	0.8268
E24 Eaves (insulation at ceiling level - inverted)	6.2100	0.2400	1.4904
E2 Other lintels (including other steel lintels)	10.4000	0.0500	0.5200
E3 Sill	7.0000	0.0500	0.3500
E4 Jamb	44.0000	0.0500	2.2000
E18 Party wall between dwellings	5.4000	0.0600	0.3240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9827 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.6730 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8479	40.6042	40.3652	39.2430	39.0331	38.0557	38.0557	37.8747	38.4322	39.0331	39.4578	39.9019	(38)
Heat transfer coeff	88.5209	88.2771	88.0382	86.9160	86.7060	85.7286	85.7286	85.5476	86.1051	86.7060	87.1308	87.5748	(39)

Average = Sum(39)m / 12 = 86.9150

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1407	1.1376	1.1345	1.1201	1.1173	1.1048	1.1048	1.1024	1.1096	1.1173	1.1228	1.1285	(40)
HLP (average)												1.1200	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4157 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.7238	63.7511	62.3338	59.6219	57.6206	55.3887	54.1201	55.5268	57.0687	59.4651	62.2352	64.4758	(42a)

Hot water usage for baths

27.9566	27.5414	26.9567	25.8787	25.0714	24.1763	23.6929	24.2734	24.9056	25.8634	26.9636	27.8621	(42b)

Hot water usage for other uses

39.3696	37.9380	36.5064	35.0748	33.6432	32.2115	32.2115	33.6432	35.0748	36.5064	37.9380	39.3696	(42c)

Average daily hot water use (litres/day) 121.3839 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.0500	129.2305	125.7969	120.5753	116.3351	111.7766	110.0245	113.4434	117.0491	121.8348	127.1368	131.7075	(44)
Energy conte	209.1350	184.0226	193.3451	165.0616	156.6095	137.4424	133.0651	140.4666	144.3333	165.3287	181.1297	206.2222	(45)
Energy content (annual)										Total = Sum(45)m =		2016.1616	
Distribution loss (46)m = 0.15 x (45)m	31.3702	27.6034	29.0018	24.7592	23.4914	20.6164	19.9598	21.0700	21.6500	24.7993	27.1695	30.9333	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	260.0939	230.0500	244.3040	214.3766	207.5684	186.7574	184.0240	191.4255	193.6483	216.2876	230.4448	257.1811	(62)
WWHRS	-29.5890	-26.1688	-27.4024	-22.6903	-21.1465	-18.0952	-16.9614	-18.0368	-18.7220	-22.0712	-25.0040	-29.0411	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	230.5049	203.8812	216.9016	191.6863	186.4218	168.6622	167.0626	173.3888	174.9263	194.2164	205.4408	228.1400	(64)
										Total per year (kWh/year) = Sum(64)m =		2341.2328	(64)
12Total per year (kWh/year)												2341	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	82.2771	72.6944	77.0270	67.2117	64.8124	58.0283	56.9839	59.4449	60.3196	67.7115	72.5544	81.3086	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.7260	125.9110	113.7260	117.5169	113.7260	117.5169	113.7260	113.7260	117.5169	113.7260	117.5169	113.7260	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.3515	216.5758	210.9707	199.0380	183.9750	169.8180	160.3603	158.1360	163.7411	175.6738	190.7368	204.8938	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	(71)
Water heating gains (Table 5)													

	110.5875	108.1761	103.5309	93.3496	87.1134	80.5949	76.5912	79.8990	83.7772	91.0101	100.7700	109.2857	(72)
Total internal gains													
	500.9013	512.8991	490.4638	472.1407	447.0506	427.1660	409.9137	410.9972	424.2714	442.6462	471.2598	490.1417	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.1500	36.7938	0.6300	0.7000	0.7700	80.3994	(79)
Northwest	4.7700	11.2829	0.6300	0.7000	0.7700	16.4480	(81)

Solar gains	96.8474	170.4303	247.7018	331.2383	393.2161	400.1383	381.7119	333.9807	276.3959	192.2745	116.9958	82.2374	(83)
Total gains	597.7486	683.3294	738.1656	803.3789	840.2667	827.3043	791.6256	744.9779	700.6673	634.9207	588.2556	572.3791	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.8770	61.0451	61.2108	62.0011	62.1513	62.8599	62.8599	62.9928	62.5850	62.1513	61.8483	61.5347	
alpha	5.0585	5.0697	5.0807	5.1334	5.1434	5.1907	5.1907	5.1995	5.1723	5.1434	5.1232	5.1023	
util living area													
	0.9939	0.9872	0.9729	0.9267	0.8195	0.6344	0.4711	0.5190	0.7619	0.9449	0.9871	0.9950	(86)
MIT	19.7765	19.9662	20.2265	20.5733	20.8364	20.9669	20.9941	20.9905	20.9161	20.5806	20.1248	19.7495	(87)
Th 2	19.9677	19.9703	19.9727	19.9845	19.9867	19.9970	19.9970	19.9989	19.9930	19.9867	19.9822	19.9776	(88)
util rest of house													
	0.9919	0.9831	0.9641	0.9027	0.7654	0.5468	0.3666	0.4108	0.6806	0.9216	0.9823	0.9934	(89)
MIT 2	18.5579	18.8002	19.1293	19.5599	19.8523	19.9786	19.9951	19.9956	19.9385	19.5789	19.0121	18.5306	(90)
Living area fraction										fLA = Living area / (4) =		0.4086	(91)
MIT	19.0558	19.2767	19.5777	19.9740	20.2544	20.3824	20.4033	20.4021	20.3380	19.9882	19.4668	19.0287	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0558	19.2767	19.5777	19.9740	20.2544	20.3824	20.4033	20.4021	20.3380	19.9882	19.4668	19.0287	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9895	0.9795	0.9598	0.9024	0.7809	0.5816	0.4094	0.4552	0.7105	0.9217	0.9790	0.9914	(94)
Useful gains	591.4776	669.3331	708.4911	724.9721	656.1737	481.1914	324.1267	339.0972	497.7943	585.2008	575.9304	567.4494	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1306.1985	1269.1308	1151.3331	962.5097	741.7221	495.7205	326.0540	342.3718	537.1217	814.0143	1077.5256	1298.6210	(97)
Space heating kWh													
	531.7524	403.0640	329.4744	171.0271	63.6480	0.0000	0.0000	0.0000	0.0000	170.2372	361.1485	543.9917	(98a)
Space heating requirement - total per year (kWh/year)												2574.3434	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	531.7524	403.0640	329.4744	171.0271	63.6480	0.0000	0.0000	0.0000	0.0000	170.2372	361.1485	543.9917	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2574.3434	
Space heating per m2											(98c) / (4) =	33.1745	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	531.7524	403.0640	329.4744	171.0271	63.6480	0.0000	0.0000	0.0000	0.0000	170.2372	361.1485	543.9917	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	575.4896	436.2165	356.5740	185.0942	68.8831	0.0000	0.0000	0.0000	0.0000	184.2394	390.8534	588.7356	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	230.5049	203.8812	216.9016	191.6863	186.4218	168.6622	167.0626	173.3888	174.9263	194.2164	205.4408	228.1400	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.1112	85.8128	85.2745	84.1379	82.3270	80.3000	80.3000	80.3000	80.3000	84.1002	85.5768	86.1731	(217)
Fuel for water heating, kWh/month													
	267.6828	237.5883	254.3570	227.8241	226.4406	210.0401	208.0481	215.9262	217.8410	230.9345	240.0660	264.7461	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.6300	18.9569	17.0686	12.5052	9.6594	7.8918	8.8116	11.4536	14.8771	19.5196	22.0473	24.2868	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.2841	-38.1880	-56.5463	-65.5541	-72.3891	-68.1806	-67.3448	-62.7427	-54.8997	-44.5515	-29.2965	-22.5938	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233b)m	-11.5898	-24.6950	-49.6724	-75.4717	-100.6420	-101.4357	-100.2424	-84.4847	-61.4119	-35.6010	-15.5655	-9.1415 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2786.0860	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2801.4948	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	190.7078	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1278.5248	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4585.7638	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2786.0860	0.2100	585.0781	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.4948	0.2100	588.3139	(264)
Space and water heating			1173.3920	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	190.7078	0.1443	27.5250	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-608.5711	0.1340	-81.5230	
PV Unit electricity exported	-669.9537	0.1256	-84.1176	
Total			-165.6406	(269)
Total CO2, kg/year			1047.2057	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2786.0860	1.1300	3148.2772	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.4948	1.1300	3165.6892	(278)
Space and water heating			6313.9663	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	190.7078	1.5338	292.5140	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-608.5711	1.4951	-909.8447	
PV Unit electricity exported	-669.9537	0.4609	-308.7586	
Total			-1218.6033	(283)
Total Primary energy kWh/year			5517.9778	(286)
Target Primary Energy Rate (TPER)			71.1100	(287)

Full SAP Calculation Printout

Property Reference	FLAT 17	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 17	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	14.39	**TER**	14.85
Environmental	90 B	**% DER < TER**			3.10
CO_2 Emissions (t/year)	0.67	**DFEE**	39.64	**TFEE**	35.12
Compliance Check	See BREL	**% DFEE < TFEE**			-12.87
% DPER < TPER	-14.85	**DPER**	90.29	**TPER**	78.62

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	34.2500	11.0000	23.2500	0.1200	2.7900			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1200	2.1984			(29a)
External Roof 1	52.4000		52.4000	0.1000	5.2400			(30)
Total net area of external elements Aum(A, m2)			107.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.8469			(33)
Main dwelling								
Party Wall 1			28.3900	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0700	0.8750	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9000	0.0800	0.4720	
E16 Corner (normal)	6.2200	0.0900	0.5598	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	4.5800	0.0800	0.3664	
E18 Party wall between dwellings	4.5800	0.0600	0.2748	
E14 Flat roof	5.9000	0.0800	0.4720	
E12 Gable (insulation at ceiling level)	10.9000	0.4800	5.2320	
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.2400	1.4880	
E10 Eaves (insulation at ceiling level)	7.8000	0.1200	0.9360	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.1050 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.9519 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	47.6614	47.5257	47.3900	46.7116	46.5759	45.8975	45.8975	45.7618	46.1688	46.5759	46.8473	47.1187	(39)

Average = Sum(39)m / 12 = 46.6777

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9096	0.9070	0.9044	0.8914	0.8889	0.8759	0.8759	0.8733	0.8811	0.8889	0.8940	0.8992	(40)
HLP (average)												0.8908	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)

Energy content (annual) Total = Sum(45)m = 1674.0285

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

26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)

Water storage loss:

Total storage loss

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

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)

Total per year (kWh/year) = Sum(64)m = 2274.0285 (64)

12Total per year (kWh/year) 2274 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

70.4767	62.3112	66.1180	57.8986	55.9762	50.2737	49.4760	51.5192	52.1756	58.3828	62.3342	69.6725	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	75.2368	69.8245	66.5000	69.2462	72.4661	78.4716	86.5753	93.6458	(72)
Total internal gains	381.4033	389.6512	373.1243	358.8210	340.1656	324.3111	311.5220	312.6757	322.6019	337.4572	359.0384	373.5512	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains 51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)

Total gains	432.5628	476.7946	492.3578	506.5570	505.6423	488.5911	469.9055	457.8239	451.7065	433.7693	420.3156	417.3330	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3488	76.5667	76.7860	77.9012	78.1281	79.2830	79.2830	79.5181	78.8170	78.1281	77.6756	77.2282	
alpha	6.0899	6.1044	6.1191	6.1934	6.2085	6.2855	6.2855	6.3012	6.2545	6.2085	6.1784	6.1485	
util living area													
	0.9887	0.9782	0.9593	0.9034	0.7867	0.5912	0.4285	0.4579	0.6798	0.9040	0.9752	0.9907	(86)
MIT	20.2121	20.3605	20.5400	20.7691	20.9241	20.9894	20.9988	20.9982	20.9753	20.8019	20.4823	20.1894	(87)
Th 2	20.1594	20.1616	20.1638	20.1748	20.1770	20.1880	20.1880	20.1902	20.1836	20.1770	20.1726	20.1682	(88)
util rest of house													
	0.9854	0.9721	0.9477	0.8772	0.7366	0.5205	0.3501	0.3783	0.6094	0.8730	0.9671	0.9879	(89)
MIT 2	19.2545	19.4425	19.6667	19.9480	20.1153	20.1821	20.1876	20.1896	20.1681	19.9913	19.6056	19.2327	(90)
Living area fraction										fLA = Living area / (4) =		0.4752	(91)
MIT	19.7095	19.8787	20.0816	20.3382	20.4996	20.5657	20.5731	20.5738	20.5517	20.3765	20.0222	19.6873	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5595	19.7287	19.9316	20.1882	20.3496	20.4157	20.4231	20.4238	20.4017	20.2265	19.8722	19.5373	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9824	0.9682	0.9439	0.8776	0.7477	0.5407	0.3729	0.4014	0.6288	0.8751	0.9635	0.9853	(94)
Useful gains	424.9671	461.6543	464.7573	444.5738	378.0672	264.1852	175.2441	183.7821	284.0472	379.5946	404.9918	411.1839	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	727.2912	704.7458	636.5261	527.2879	402.8635	266.9281	175.4693	184.1368	290.9409	448.3612	598.3424	722.6718	(97)
Space heating kWh													
	224.9292	163.3575	127.7960	59.5541	18.4485	0.0000	0.0000	0.0000	0.0000	51.1624	139.2125	231.7469	(98a)
Space heating requirement - total per year (kWh/year)												1016.2071	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.9292	163.3575	127.7960	59.5541	18.4485	0.0000	0.0000	0.0000	0.0000	51.1624	139.2125	231.7469	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1016.2071	
Space heating per m2											(98c) / (4) =	19.3933	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	224.9292	163.3575	127.7960	59.5541	18.4485	0.0000	0.0000	0.0000	0.0000	51.1624	139.2125	231.7469	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	251.3175	182.5224	142.7888	66.5409	20.6128	0.0000	0.0000	0.0000	0.0000	57.1646	155.5447	258.9351	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	194.0168	170.7206	179.3699	153.1307	145.2899	127.5083	123.4469	130.3128	133.8995	153.3771	168.0360	191.3144	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2662	57.1437	63.2662	61.2254	63.2662	61.2254	63.2662	63.2662	61.2254	63.2662	61.2254	63.2662	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1135.4269	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												1870.4229	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9086	(230a)
central heating pump	41.0000	(230c)

maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	744.9086	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3886.2530	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1135.4269	0.2100	238.4397	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.4229	0.2100	392.7888	(264)
Space and water heating			631.2285	(265)
Pumps, fans and electric keep-hot	744.9086	0.1387	103.3280	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Total CO2, kg/year			754.1125	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.3900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1135.4269	1.1300	1283.0324	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.4229	1.1300	2113.5779	(278)
Space and water heating			3396.6103	(279)
Pumps, fans and electric keep-hot	744.9086	1.5128	1126.8977	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Total Primary energy kWh/year			4731.3341	(286)
Dwelling Primary energy Rate (DPER)			90.2900	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4000 (1b)	x	2.7000 (2b)	=	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3033	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2600	1.1450	9.4580			(27)
External Wall 1	34.2500	10.9000	23.3500	0.1800	4.2030			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1800	3.2976			(29a)
External Roof 1	52.4000		52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			107.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.5626			(33)
Main dwelling								
Party Wall 1			28.3900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0700	0.8750
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9000	0.0200	0.1180
E16 Corner (normal)	6.2200	0.0900	0.5598
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	4.5800	0.0600	0.2748
E18 Party wall between dwellings	4.5800	0.0600	0.2748
E14 Flat roof	5.9000	0.0800	0.4720
E12 Gable (insulation at ceiling level)	10.9000	0.0600	0.6540
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.1200	0.7440
E10 Eaves (insulation at ceiling level)	7.8000	0.0600	0.4680
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0074 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5700 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff	60.4053	60.2697	60.1369	59.5127	59.3960	58.8524	58.8524	58.7517	59.0618	59.3960	59.6322	59.8792	(39)
Average = Sum(39)m / 12 =												59.5122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1528	1.1502	1.1477	1.1357	1.1335	1.1231	1.1231	1.1212	1.1271	1.1335	1.1380	1.1427	(40)
HLP (average)												1.1357	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers												
53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)
Hot water usage for baths												
23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)
Hot water usage for other uses												
32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)
Average daily hot water use (litres/day)												100.7857	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m													
	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2234	45.7690	46.5531	47.9995	47.9273	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	224.6039	198.8223	211.4950	186.3671	179.2578	159.8890	157.0381	164.6294	167.7674	188.2314	199.7073	222.1853	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
										Total per year (kWh/year) = Sum(64)m =		2031.7064	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	70.4767	62.3112	66.1180	57.8986	55.5423	49.3871	48.3745	50.7793	51.8286	58.3828	62.3342	69.6725	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.9944	89.6723	80.9944	83.6942	80.9944	83.6942	80.9944	80.9944	83.6942	80.9944	83.6942	80.9944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)													
	94.7267	92.7249	88.8682	80.4147	74.6536	68.5933	65.0195	68.2518	71.9842	78.4716	86.5753	93.6458	(72)
Total internal gains													
	381.5973	389.8660	373.3183	359.0214	339.7764	323.2803	310.2355	311.8753	322.3205	337.6512	359.2389	373.7452	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.1700	36.7938	0.6300	0.7000	0.7700	24.4009	(77)
Southwest	6.0900	36.7938	0.6300	0.7000	0.7700	68.4801	(79)

Solar gains	92.8810	158.2107	216.4708	268.2178	300.4263	298.2538	287.5485	263.5195	234.3921	174.8565	111.2500	79.4868	(83)
Total gains	474.4783	548.0767	589.7891	627.2392	640.2027	621.5340	597.7840	575.3948	556.7126	512.5077	470.4889	453.2320	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.2412	60.3767	60.5101	61.1447	61.2649	61.8308	61.8308	61.9367	61.6116	61.2649	61.0222	60.7705	
alpha	5.0161	5.0251	5.0340	5.0763	5.0843	5.1221	5.1221	5.1291	5.1074	5.0843	5.0681	5.0514	
util living area	0.9878	0.9745	0.9501	0.8873	0.7685	0.5868	0.4298	0.4645	0.6852	0.9029	0.9747	0.9901	(86)
MIT	19.8957	20.1076	20.3622	20.6646	20.8761	20.9754	20.9958	20.9938	20.9464	20.6820	20.2408	19.8586	(87)
Th 2	19.9580	19.9601	19.9621	19.9718	19.9736	19.9820	19.9820	19.9835	19.9787	19.9736	19.9699	19.9661	(88)
util rest of house	0.9841	0.9670	0.9353	0.8553	0.7095	0.5016	0.3322	0.3646	0.6014	0.8682	0.9658	0.9871	(89)
MIT 2	18.7015	18.9687	19.2847	19.6495	19.8756	19.9688	19.9807	19.9815	19.9460	19.6792	19.1463	18.6605	(90)
Living area fraction										fLA = Living area / (4) =		0.4752	(91)
MIT	19.2690	19.5099	19.7967	20.1319	20.3510	20.4471	20.4631	20.4626	20.4214	20.1557	19.6664	19.2298	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2690	19.5099	19.7967	20.1319	20.3510	20.4471	20.4631	20.4626	20.4214	20.1557	19.6664	19.2298	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9630	0.9326	0.8608	0.7324	0.5414	0.3787	0.4121	0.6392	0.8752	0.9626	0.9842	(94)
Useful gains	465.4115	527.8075	550.0117	539.9339	468.8772	336.4781	226.3530	237.1438	355.8466	448.5267	452.8957	446.0839	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	904.2050	880.5350	799.6239	668.4385	513.8352	344.1172	227.3520	238.6820	373.3530	567.5723	749.3625	899.9736	(97)
Space heating kWh	326.4623	237.0329	185.7115	92.5233	33.4488	0.0000	0.0000	0.0000	0.0000	88.5699	213.4561	337.6939	(98a)
Space heating requirement - total per year (kWh/year)												1514.8987	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	326.4623	237.0329	185.7115	92.5233	33.4488	0.0000	0.0000	0.0000	0.0000	88.5699	213.4561	337.6939	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1514.8987	
Space heating per m2											(98c) / (4) =	28.9103	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	326.4623	237.0329	185.7115	92.5233	33.4488	0.0000	0.0000	0.0000	0.0000	88.5699	213.4561	337.6939	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	353.3142	256.5291	200.9864	100.1334	36.2000	0.0000	0.0000	0.0000	0.0000	95.8549	231.0131	365.4696	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.4241	85.0068	84.3468	83.1623	81.6539	80.3000	80.3000	80.3000	80.3000	83.0531	84.7603	85.5142	(217)
Fuel for water heating, kWh/month	234.1666	208.3281	223.7684	201.4448	198.0294	180.4029	178.0251	186.3669	189.5660	204.5734	211.1190	231.6236	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8290	13.5009	12.1560	8.9060	6.8793	5.6204	6.2755	8.1571	10.5953	13.9016	15.7019	17.2968	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0245	-26.3361	-39.2267	-45.7721	-50.8307	-48.0133	-47.4576	-44.0915	-38.3726	-30.8845	-20.1532	-15.4794	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5501	-16.1261	-32.4983	-49.4567	-66.0099	-66.5214	-65.7070	-55.3250	-40.1678	-23.2390	-10.1402	-5.9501	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1639.5008	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2447.4141	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8199	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3445.4010	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1639.5008	0.2100	344.2952	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2447.4141	0.2100	513.9570	(264)
Space and water heating			858.2521	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8199	0.1443	19.6030	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6423	0.1338	-56.8242	
PV Unit electricity exported	-438.6915	0.1255	-55.0660	
Total			-111.8902	(269)
Total CO2, kg/year			777.8942	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1639.5008	1.1300	1852.6359	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2447.4141	1.1300	2765.5779	(278)
Space and water heating			4618.2138	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8199	1.5338	208.3251	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6423	1.4945	-634.6363	
PV Unit electricity exported	-438.6915	0.4607	-202.1227	
Total			-836.7590	(283)
Total Primary energy kWh/year			4119.8807	(286)
Target Primary Energy Rate (TPER)			78.6200	(287)

Full SAP Calculation Printout

Property Reference	FLAT 18	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 18	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	14.43	**TER**	14.70
Environmental	90 B	**% DER < TER**			1.84
CO_2 Emissions (t/year)	0.68	**DFEE**	39.83	**TFEE**	34.48
Compliance Check	See BREL	**% DFEE < TFEE**			-15.51
% DPER < TPER	-16.25	**DPER**	90.50	**TPER**	77.85

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.5610	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.1600	13.2000	15.9600	0.1200	1.9152			(29a)
EXPOSED WALL TO CORRIDOR	20.5200		20.5200	0.1200	2.4624			(29a)
External Roof 1	52.4000		52.4000	0.1000	5.2400			(30)
Total net area of external elements Aum(A, m2)			102.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2361			(33)
Main dwelling								
Party Wall 1			33.4800	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.2000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.5000	0.0800	0.6000	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E14 Flat roof	5.9000	0.0800	0.4720	
E12 Gable (insulation at ceiling level)	10.9000	0.4800	5.2320	
E10 Eaves (insulation at ceiling level)	1.6000	0.1200	0.1920	
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.2400	2.9760	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.1421 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7167	12.5810	12.4452	11.7664	11.6306	10.9518	10.9518	10.8160	11.2233	11.6306	11.9021	12.1737	(38)
Heat transfer coeff	47.8589	47.7231	47.5874	46.9085	46.7728	46.0939	46.0939	45.9582	46.3655	46.7728	47.0443	47.3158	(39)

Average = Sum(39)m / 12 = 46.8746

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9128	0.9102	0.9076	0.8947	0.8921	0.8792	0.8792	0.8766	0.8843	0.8921	0.8973	0.9025	(40)
HLP (average)												0.8940	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)

Energy content (annual) Total = Sum(45)m = 1674.4908

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

26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)

Water storage loss:

Total storage loss

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

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(64)

Total per year (kWh/year) = Sum(64)m = 2274.4908 (64)

12Total per year (kWh/year) 2274 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

70.4926	62.3252	66.1327	57.9111	55.9881	50.2841	49.4861	51.5299	52.1866	58.3954	62.3480	69.6882	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8505	89.5130	80.8505	83.5455	80.8505	83.5455	80.8505	80.8505	83.5455	80.8505	83.5455	80.8505	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	94.7482	92.7458	88.8881	80.4321	75.2528	69.8391	66.5136	69.2606	72.4814	78.4885	86.5944	93.6670	(72)
Total internal gains	381.5659	389.8194	373.2841	358.9757	340.3117	324.4523	311.6572	312.8109	322.7416	337.6012	359.1918	373.7100	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains 51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)

Total gains	432.7253	476.9628	492.5175	506.7117	505.7884	488.7323	470.0407	457.9591	451.8463	433.9133	420.4690	417.4919	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.0773	76.2937	76.5113	77.6186	77.8439	78.9903	78.9903	79.2236	78.5277	77.8439	77.3946	76.9504	
alpha	6.0718	6.0862	6.1008	6.1746	6.1896	6.2660	6.2660	6.2816	6.2352	6.1896	6.1596	6.1300	
util living area													
	0.9888	0.9784	0.9597	0.9044	0.7885	0.5932	0.4302	0.4597	0.6819	0.9050	0.9754	0.9907	(86)
MIT	20.2064	20.3551	20.5351	20.7656	20.9224	20.9891	20.9987	20.9981	20.9746	20.7989	20.4775	20.1836	(87)
Th 2	20.1566	20.1588	20.1610	20.1720	20.1742	20.1853	20.1853	20.1875	20.1808	20.1742	20.1698	20.1654	(88)
util rest of house													
	0.9855	0.9724	0.9482	0.8783	0.7383	0.5222	0.3513	0.3795	0.6112	0.8741	0.9674	0.9880	(89)
MIT 2	19.2451	19.4334	19.6585	19.9416	20.1111	20.1791	20.1848	20.1868	20.1649	19.9856	19.5975	19.2232	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.7017	19.8711	20.0748	20.3329	20.4964	20.5638	20.5714	20.5721	20.5494	20.3718	20.0155	19.6794	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5517	19.7211	19.9248	20.1829	20.3464	20.4138	20.4214	20.4221	20.3994	20.2218	19.8655	19.5294	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9825	0.9685	0.9444	0.8786	0.7494	0.5425	0.3742	0.4028	0.6307	0.8761	0.9638	0.9853	(94)
Useful gains	425.1714	461.9240	465.1249	445.2162	379.0308	265.1413	175.9065	184.4780	284.9743	380.1564	405.2532	411.3756	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	729.9281	707.3100	638.8524	529.2663	404.4151	267.9809	176.1416	184.8477	292.0758	450.0391	600.5425	725.3210	(97)
Space heating kWh													
	226.7390	164.8994	129.2533	60.5161	18.8860	0.0000	0.0000	0.0000	0.0000	51.9927	140.6083	233.5754	(98a)
Space heating requirement - total per year (kWh/year)												1026.4701	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	226.7390	164.8994	129.2533	60.5161	18.8860	0.0000	0.0000	0.0000	0.0000	51.9927	140.6083	233.5754	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1026.4701	
Space heating per m2											(98c) / (4) =	19.5779	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	226.7390	164.8994	129.2533	60.5161	18.8860	0.0000	0.0000	0.0000	0.0000	51.9927	140.6083	233.5754	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	253.3397	184.2451	144.4171	67.6157	21.1017	0.0000	0.0000	0.0000	0.0000	58.0924	157.1043	260.9781	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	194.0703	170.7677	179.4195	153.1730	145.3300	127.5436	123.4810	130.3488	133.9365	153.4195	168.0824	191.3672	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2713	57.1482	63.2713	61.2303	63.2713	61.2303	63.2713	63.2713	61.2303	63.2713	61.2303	63.2713	(231)
Lighting	16.7991	13.4769	12.1344	8.8902	6.8671	5.6104	6.2644	8.1426	10.5765	13.8769	15.6740	17.2660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1146.8940	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												1870.9394	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9681	(230a)
central heating pump	41.0000	(230c)

maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	744.9681	(231)
Electricity for lighting (calculated in Appendix L)	135.5786	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3898.3801	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1146.8940	0.2100	240.8477	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.9394	0.2100	392.8973	(264)
Space and water heating			633.7450	(265)
Pumps, fans and electric keep-hot	744.9681	0.1387	103.3363	(267)
Energy for lighting	135.5786	0.1443	19.5682	(268)
Total CO2, kg/year			756.6495	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.4300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1146.8940	1.1300	1295.9902	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.9394	1.1300	2114.1615	(278)
Space and water heating			3410.1517	(279)
Pumps, fans and electric keep-hot	744.9681	1.5128	1126.9877	(281)
Energy for lighting	135.5786	1.5338	207.9550	(282)
Total Primary energy kWh/year			4745.0944	(286)
Dwelling Primary energy Rate (DPER)			90.5000	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4300 (1b)	x	2.7000 (2b)	=	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.5610	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3791	0.3715	0.3336	0.3260	0.2881	0.2881	0.2805	0.3032	0.3260	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2700	1.1450	9.4695			(27)
External Wall 1	29.1600	13.1100	16.0500	0.1800	2.8890			(29a)
EXPOSED WALL TO CORRIDOR	20.5200		20.5200	0.1800	3.6936			(29a)
External Roof 1	52.4000		52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			102.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6561			(33)
Main dwelling								
Party Wall 1			33.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.2000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.5000	0.0200	0.1500
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E14 Flat roof	5.9000	0.0800	0.4720
E12 Gable (insulation at ceiling level)	10.9000	0.0600	0.6540
E10 Eaves (insulation at ceiling level)	1.6000	0.0600	0.0960
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.1200	1.4880
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3240 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.9801 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8492	26.7136	26.5807	25.9565	25.8397	25.2960	25.2960	25.1953	25.5054	25.8397	26.0760	26.3230	(38)
Heat transfer coeff	59.8293	59.6937	59.5608	58.9366	58.8198	58.2761	58.2761	58.1754	58.4855	58.8198	59.0560	59.3031	(39)
Average = Sum(39)m / 12 =												58.9360	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1411	1.1385	1.1360	1.1241	1.1219	1.1115	1.1115	1.1096	1.1155	1.1219	1.1264	1.1311	(40)
HLP (average)												1.1241	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2370	45.7817	46.5660	48.0127	47.9406	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6519	198.8645	211.5393	186.4049	179.3073	159.9331	157.0814	164.6749	167.8137	188.2693	199.7488	222.2325	(62)
WWHRS	-24.5761	-21.7353	-22.7599	-18.8461	-17.5639	-15.0296	-14.0878	-14.9810	-15.5502	-18.3319	-20.7679	-24.1210	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0758	177.1292	188.7794	167.5588	161.7434	144.9036	142.9936	149.6939	152.2635	169.9374	178.9810	198.1116	(64)
									Total per year (kWh/year) = Sum(64)m =			2032.1712	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	70.4926	62.3252	66.1327	57.9111	55.5576	49.4008	48.3879	50.7934	51.8430	58.3954	62.3480	69.6882	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0251	89.7063	81.0251	83.7259	81.0251	83.7259	81.0251	81.0251	83.7259	81.0251	83.7259	81.0251	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	94.7482	92.7458	88.8881	80.4321	74.6742	68.6122	65.0375	68.2706	72.0041	78.4885	86.5944	93.6670	(72)
Total internal gains	381.7405	390.0127	373.4586	359.1561	339.9077	323.4058	310.3556	311.9955	322.4448	337.7758	359.3722	373.8846	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.1800	36.7938	0.6300	0.7000	0.7700	24.5134	(77)
Southwest	6.0900	36.7938	0.6300	0.7000	0.7700	68.4801	(79)

Solar gains	92.9935	158.4023	216.7329	268.5425	300.7900	298.6149	287.8966	263.8385	234.6759	175.0682	111.3847	79.5830	(83)
Total gains	474.7339	548.4149	590.1915	627.6986	640.6977	622.0206	598.2522	575.8340	557.1207	512.8440	470.7569	453.4676	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.8560	60.9942	61.1303	61.7778	61.9005	62.4780	62.4780	62.5861	62.2543	61.9005	61.6528	61.3960	
alpha	5.0571	5.0663	5.0754	5.1185	5.1267	5.1652	5.1652	5.1724	5.1503	5.1267	5.1102	5.0931	
util living area	0.9877	0.9741	0.9491	0.8850	0.7643	0.5817	0.4255	0.4600	0.6804	0.9009	0.9743	0.9900	(86)
MIT	19.9141	20.1254	20.3779	20.6762	20.8822	20.9771	20.9962	20.9943	20.9496	20.6923	20.2562	19.8770	(87)
Th 2	19.9674	19.9695	19.9715	19.9812	19.9830	19.9915	19.9915	19.9930	19.9882	19.9830	19.9793	19.9755	(88)
util rest of house	0.9839	0.9665	0.9342	0.8527	0.7054	0.4977	0.3296	0.3618	0.5972	0.8659	0.9653	0.9870	(89)
MIT 2	18.7316	18.9981	19.3113	19.6705	19.8901	19.9792	19.9903	19.9911	19.9575	19.6986	19.1726	18.6908	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	19.2932	19.5335	19.8178	20.1481	20.3612	20.4531	20.4680	20.4676	20.4286	20.1705	19.6872	19.2542	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2932	19.5335	19.8178	20.1481	20.3612	20.4531	20.4680	20.4676	20.4286	20.1705	19.6872	19.2542	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9626	0.9316	0.8585	0.7285	0.5370	0.3753	0.4085	0.6348	0.8731	0.9622	0.9841	(94)
Useful gains	465.5927	527.8931	549.8017	538.8907	466.7421	334.0060	224.5027	235.2264	353.6822	447.7889	452.9428	446.2681	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	897.0317	873.5260	793.2212	662.9256	509.4516	341.0977	225.4129	236.6335	370.1335	562.9374	743.3512	892.7592	(97)
Space heating kWh	320.9906	232.2653	181.1040	89.3051	31.7758	0.0000	0.0000	0.0000	0.0000	85.6704	209.0940	332.1894	(98a)
Space heating requirement - total per year (kWh/year)												1482.3947	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	320.9906	232.2653	181.1040	89.3051	31.7758	0.0000	0.0000	0.0000	0.0000	85.6704	209.0940	332.1894	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1482.3947	
Space heating per m2											(98c) / (4) =	28.2738	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	320.9906	232.2653	181.1040	89.3051	31.7758	0.0000	0.0000	0.0000	0.0000	85.6704	209.0940	332.1894	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	347.3924	251.3693	196.0000	96.6505	34.3894	0.0000	0.0000	0.0000	0.0000	92.7169	226.2922	359.5123	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0758	177.1292	188.7794	167.5588	161.7434	144.9036	142.9936	149.6939	152.2635	169.9374	178.9810	198.1116	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3886	84.9630	84.2925	83.0948	81.5961	80.3000	80.3000	80.3000	80.3000	82.9908	84.7156	85.4799	(217)
Fuel for water heating, kWh/month	234.3121	208.4780	223.9574	201.6478	198.2244	180.4528	178.0743	186.4183	189.6183	204.7665	211.2729	231.7639	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8354	13.5060	12.1606	8.9094	6.8819	5.6226	6.2779	8.1602	10.5993	13.9069	15.7078	17.3033	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0344	-26.3504	-39.2477	-45.7962	-50.8571	-48.0381	-47.4820	-44.1143	-38.3927	-30.9010	-20.1642	-15.4880	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5549	-16.1362	-32.5183	-49.4871	-66.0504	-66.5622	-65.7474	-55.3591	-40.1926	-23.2535	-10.1465	-5.9538	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1604.3232	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2448.9867	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.8280	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3411.3533	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1604.3232	0.2100	336.9079	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2448.9867	0.2100	514.2872	(264)
Space and water heating			851.1951	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8714	0.1443	19.6104	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	0.1338	-56.8542	
PV Unit electricity exported	-438.9620	0.1255	-55.0999	
Total			-111.9542	(269)
Total CO2, kg/year			770.7806	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1604.3232	1.1300	1812.8853	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2448.9867	1.1300	2767.3550	(278)
Space and water heating			4580.2403	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8714	1.5338	208.4040	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	1.4945	-634.9711	
PV Unit electricity exported	-438.9620	0.4607	-202.2474	
Total			-837.2185	(283)
Total Primary energy kWh/year			4081.5266	(286)
Target Primary Energy Rate (TPER)			77.8500	(287)

Full SAP Calculation Printout

Property Reference	FLAT 19	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 19	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	14.43	**TER**	14.70
Environmental	90 B	**% DER < TER**			1.84
CO_2 Emissions (t/year)	0.68	**DFEE**	39.83	**TFEE**	34.48
Compliance Check	See BREL	**% DFEE < TFEE**			-15.51
% DPER < TPER	-16.25	**DPER**	90.50	**TPER**	77.85

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.5610	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.1600	13.2000	15.9600	0.1200	1.9152			(29a)
EXPOSED WALL TO CORRIDOR	20.5200		20.5200	0.1200	2.4624			(29a)
External Roof 1	52.4000		52.4000	0.1000	5.2400			(30)
Total net area of external elements Aum(A, m2)			102.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2361			(33)
Main dwelling								
Party Wall 1			33.4800	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.5000	0.0800	0.6000	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E14 Flat roof	5.9000	0.0800	0.4720	
E12 Gable (insulation at ceiling level)	10.9000	0.4800	5.2320	
E10 Eaves (insulation at ceiling level)	1.6000	0.1200	0.1920	
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.2400	2.9760	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.9060	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	35.1421	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7167	12.5810	12.4452	11.7664	11.6306	10.9518	10.9518	10.8160	11.2233	11.6306	11.9021	12.1737	(38)
Heat transfer coeff	47.8589	47.7231	47.5874	46.9085	46.7728	46.0939	46.0939	45.9582	46.3655	46.7728	47.0443	47.3158	(39)
Average = Sum(39)m / 12 =												46.8746	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9128	0.9102	0.9076	0.8947	0.8921	0.8792	0.8792	0.8766	0.8843	0.8921	0.8973	0.9025	(40)
HLP (average)												0.8940	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.7618	(42)
Hot water usage for mixer showers	53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)
Hot water usage for baths	23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)
Hot water usage for other uses	32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)
Average daily hot water use (litres/day)												100.8135	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.4908	(64)
12Total per year (kWh/year)												2274	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4926	62.3252	66.1327	57.9111	55.9881	50.2841	49.4861	51.5299	52.1866	58.3954	62.3480	69.6882	(65)

---

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8505	89.5130	80.8505	83.5455	80.8505	83.5455	80.8505	80.8505	83.5455	80.8505	83.5455	80.8505	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	94.7482	92.7458	88.8881	80.4321	75.2528	69.8391	66.5136	69.2606	72.4814	78.4885	86.5944	93.6670	(72)
Total internal gains	381.5659	389.8194	373.2841	358.9757	340.3117	324.4523	311.6572	312.8109	322.7416	337.6012	359.1918	373.7100	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)

Total gains	432.7253	476.9628	492.5175	506.7117	505.7884	488.7323	470.0407	457.9591	451.8463	433.9133	420.4690	417.4919	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.0773	76.2937	76.5113	77.6186	77.8439	78.9903	78.9903	79.2236	78.5277	77.8439	77.3946	76.9504	
alpha	6.0718	6.0862	6.1008	6.1746	6.1896	6.2660	6.2660	6.2816	6.2352	6.1896	6.1596	6.1300	
util living area													
	0.9888	0.9784	0.9597	0.9044	0.7885	0.5932	0.4302	0.4597	0.6819	0.9050	0.9754	0.9907	(86)
MIT	20.2064	20.3551	20.5351	20.7656	20.9224	20.9891	20.9987	20.9981	20.9746	20.7989	20.4775	20.1836	(87)
Th 2	20.1566	20.1588	20.1610	20.1720	20.1742	20.1853	20.1853	20.1875	20.1808	20.1742	20.1698	20.1654	(88)
util rest of house													
	0.9855	0.9724	0.9482	0.8783	0.7383	0.5222	0.3513	0.3795	0.6112	0.8741	0.9674	0.9880	(89)
MIT 2	19.2451	19.4334	19.6585	19.9416	20.1111	20.1791	20.1848	20.1868	20.1649	19.9856	19.5975	19.2232	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.7017	19.8711	20.0748	20.3329	20.4964	20.5638	20.5714	20.5721	20.5494	20.3718	20.0155	19.6794	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5517	19.7211	19.9248	20.1829	20.3464	20.4138	20.4214	20.4221	20.3994	20.2218	19.8655	19.5294	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9825	0.9685	0.9444	0.8786	0.7494	0.5425	0.3742	0.4028	0.6307	0.8761	0.9638	0.9853	(94)
Useful gains	425.1714	461.9240	465.1249	445.2162	379.0308	265.1413	175.9065	184.4780	284.9743	380.1564	405.2532	411.3756	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	729.9281	707.3100	638.8524	529.2663	404.4151	267.9809	176.1416	184.8477	292.0758	450.0391	600.5425	725.3210	(97)
Space heating kWh													
	226.7390	164.8994	129.2533	60.5161	18.8860	0.0000	0.0000	0.0000	0.0000	51.9927	140.6083	233.5754	(98a)
Space heating requirement - total per year (kWh/year)												1026.4701	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	226.7390	164.8994	129.2533	60.5161	18.8860	0.0000	0.0000	0.0000	0.0000	51.9927	140.6083	233.5754	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1026.4701	
Space heating per m2											(98c) / (4) =	19.5779	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	226.7390	164.8994	129.2533	60.5161	18.8860	0.0000	0.0000	0.0000	0.0000	51.9927	140.6083	233.5754	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	253.3397	184.2451	144.4171	67.6157	21.1017	0.0000	0.0000	0.0000	0.0000	58.0924	157.1043	260.9781	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	224.6519	198.8645	211.5393	186.4049	181.0292	163.4665	161.4744	167.6211	169.1882	188.2693	199.7488	222.2325	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	194.0703	170.7677	179.4195	153.1730	145.3300	127.5436	123.4810	130.3488	133.9365	153.4195	168.0824	191.3672	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2713	57.1482	63.2713	61.2303	63.2713	61.2303	63.2713	63.2713	61.2303	63.2713	61.2303	63.2713	(231)
Lighting	16.7991	13.4769	12.1344	8.8902	6.8671	5.6104	6.2644	8.1426	10.5765	13.8769	15.6740	17.2660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1146.8940	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												1870.9394	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9681	(230a)
central heating pump	41.0000	(230c)

maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	744.9681	(231)
Electricity for lighting (calculated in Appendix L)	135.5786	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3898.3801	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1146.8940	0.2100	240.8477	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1870.9394	0.2100	392.8973	(264)
Space and water heating			633.7450	(265)
Pumps, fans and electric keep-hot	744.9681	0.1387	103.3363	(267)
Energy for lighting	135.5786	0.1443	19.5682	(268)
Total CO2, kg/year			756.6495	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.4300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1146.8940	1.1300	1295.9902	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1870.9394	1.1300	2114.1615	(278)
Space and water heating			3410.1517	(279)
Pumps, fans and electric keep-hot	744.9681	1.5128	1126.9877	(281)
Energy for lighting	135.5786	1.5338	207.9550	(282)
Total Primary energy kWh/year			4745.0944	(286)
Dwelling Primary energy Rate (DPER)			90.5000	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4300 (1b)	x	2.7000 (2b)	=	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.5610	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3791	0.3715	0.3336	0.3260	0.2881	0.2881	0.2805	0.3032	0.3260	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2700	1.1450	9.4695			(27)
External Wall 1	29.1600	13.1100	16.0500	0.1800	2.8890			(29a)
EXPOSED WALL TO CORRIDOR	20.5200		20.5200	0.1800	3.6936			(29a)
External Roof 1	52.4000		52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			102.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6561			(33)
Main dwelling								
Party Wall 1			33.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.5000	0.0200	0.1500
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E14 Flat roof	5.9000	0.0800	0.4720
E12 Gable (insulation at ceiling level)	10.9000	0.0600	0.6540
E10 Eaves (insulation at ceiling level)	1.6000	0.0600	0.0960
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.1200	1.4880
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3240 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.9801 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8492	26.7136	26.5807	25.9565	25.8397	25.2960	25.2960	25.1953	25.5054	25.8397	26.0760	26.3230	(38)
Heat transfer coeff	59.8293	59.6937	59.5608	58.9366	58.8198	58.2761	58.2761	58.1754	58.4855	58.8198	59.0560	59.3031	(39)
Average = Sum(39)m / 12 =												58.9360	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1411	1.1385	1.1360	1.1241	1.1219	1.1115	1.1115	1.1096	1.1155	1.1219	1.1264	1.1311	(40)
HLP (average)												1.1241	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2370	45.7817	46.5660	48.0127	47.9406	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6519	198.8645	211.5393	186.4049	179.3073	159.9331	157.0814	164.6749	167.8137	188.2693	199.7488	222.2325	(62)
WWHRS	-24.5761	-21.7353	-22.7599	-18.8461	-17.5639	-15.0296	-14.0878	-14.9810	-15.5502	-18.3319	-20.7679	-24.1210	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0758	177.1292	188.7794	167.5588	161.7434	144.9036	142.9936	149.6939	152.2635	169.9374	178.9810	198.1116	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.1712	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4926	62.3252	66.1327	57.9111	55.5576	49.4008	48.3879	50.7934	51.8430	58.3954	62.3480	69.6882	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0251	89.7063	81.0251	83.7259	81.0251	83.7259	81.0251	81.0251	83.7259	81.0251	83.7259	81.0251	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	94.7482	92.7458	88.8881	80.4321	74.6742	68.6122	65.0375	68.2706	72.0041	78.4885	86.5944	93.6670	(72)
Total internal gains	381.7405	390.0127	373.4586	359.1561	339.9077	323.4058	310.3556	311.9955	322.4448	337.7758	359.3722	373.8846	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.1800	36.7938	0.6300	0.7000	0.7700	24.5134	(77)
Southwest	6.0900	36.7938	0.6300	0.7000	0.7700	68.4801	(79)

Solar gains	92.9935	158.4023	216.7329	268.5425	300.7900	298.6149	287.8966	263.8385	234.6759	175.0682	111.3847	79.5830	(83)
Total gains	474.7339	548.4149	590.1915	627.6986	640.6977	622.0206	598.2522	575.8340	557.1207	512.8440	470.7569	453.4676	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.8560	60.9942	61.1303	61.7778	61.9005	62.4780	62.4780	62.5861	62.2543	61.9005	61.6528	61.3960	
alpha	5.0571	5.0663	5.0754	5.1185	5.1267	5.1652	5.1652	5.1724	5.1503	5.1267	5.1102	5.0931	
util living area	0.9877	0.9741	0.9491	0.8850	0.7643	0.5817	0.4255	0.4600	0.6804	0.9009	0.9743	0.9900	(86)
MIT	19.9141	20.1254	20.3779	20.6762	20.8822	20.9771	20.9962	20.9943	20.9496	20.6923	20.2562	19.8770	(87)
Th 2	19.9674	19.9695	19.9715	19.9812	19.9830	19.9915	19.9915	19.9930	19.9882	19.9830	19.9793	19.9755	(88)
util rest of house	0.9839	0.9665	0.9342	0.8527	0.7054	0.4977	0.3296	0.3618	0.5972	0.8659	0.9653	0.9870	(89)
MIT 2	18.7316	18.9981	19.3113	19.6705	19.8901	19.9792	19.9903	19.9911	19.9575	19.6986	19.1726	18.6908	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	19.2932	19.5335	19.8178	20.1481	20.3612	20.4531	20.4680	20.4676	20.4286	20.1705	19.6872	19.2542	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2932	19.5335	19.8178	20.1481	20.3612	20.4531	20.4680	20.4676	20.4286	20.1705	19.6872	19.2542	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9626	0.9316	0.8585	0.7285	0.5370	0.3753	0.4085	0.6348	0.8731	0.9622	0.9841	(94)
Useful gains	465.5927	527.8931	549.8017	538.8907	466.7421	334.0060	224.5027	235.2264	353.6822	447.7889	452.9428	446.2681	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	897.0317	873.5260	793.2212	662.9256	509.4516	341.0977	225.4129	236.6335	370.1335	562.9374	743.3512	892.7592	(97)
Space heating kWh	320.9906	232.2653	181.1040	89.3051	31.7758	0.0000	0.0000	0.0000	0.0000	85.6704	209.0940	332.1894	(98a)
Space heating requirement - total per year (kWh/year)												1482.3947	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	320.9906	232.2653	181.1040	89.3051	31.7758	0.0000	0.0000	0.0000	0.0000	85.6704	209.0940	332.1894	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1482.3947	
Space heating per m2											(98c) / (4) =	28.2738	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	320.9906	232.2653	181.1040	89.3051	31.7758	0.0000	0.0000	0.0000	0.0000	85.6704	209.0940	332.1894	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	347.3924	251.3693	196.0000	96.6505	34.3894	0.0000	0.0000	0.0000	0.0000	92.7169	226.2922	359.5123	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0758	177.1292	188.7794	167.5588	161.7434	144.9036	142.9936	149.6939	152.2635	169.9374	178.9810	198.1116	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3886	84.9630	84.2925	83.0948	81.5961	80.3000	80.3000	80.3000	80.3000	82.9908	84.7156	85.4799	(217)
Fuel for water heating, kWh/month	234.3121	208.4780	223.9574	201.6478	198.2244	180.4528	178.0743	186.4183	189.6183	204.7665	211.2729	231.7639	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8354	13.5060	12.1606	8.9094	6.8819	5.6226	6.2779	8.1602	10.5993	13.9069	15.7078	17.3033	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0344	-26.3504	-39.2477	-45.7962	-50.8571	-48.0381	-47.4820	-44.1143	-38.3927	-30.9010	-20.1642	-15.4880	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5549	-16.1362	-32.5183	-49.4871	-66.0504	-66.5622	-65.7474	-55.3591	-40.1926	-23.2535	-10.1465	-5.9538	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1604.3232	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2448.9867	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.8280	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3411.3533	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1604.3232	0.2100	336.9079	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2448.9867	0.2100	514.2872	(264)
Space and water heating			851.1951	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8714	0.1443	19.6104	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	0.1338	-56.8542	
PV Unit electricity exported	-438.9620	0.1255	-55.0999	
Total			-111.9542	(269)
Total CO2, kg/year			770.7806	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1604.3232	1.1300	1812.8853	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2448.9867	1.1300	2767.3550	(278)
Space and water heating			4580.2403	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8714	1.5338	208.4040	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	1.4945	-634.9711	
PV Unit electricity exported	-438.9620	0.4607	-202.2474	
Total			-837.2185	(283)
Total Primary energy kWh/year			4081.5266	(286)
Target Primary Energy Rate (TPER)			77.8500	(287)

Full SAP Calculation Printout

Property Reference	FLAT 20	**Issued on Date**	17/06/2025
Assessment Reference	Flat 20	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	13.81	**TER**	14.56
Environmental	90 B	**% DER < TER**			5.15
CO_2 Emissions (t/year)	0.73	**DFEE**	39.40	**TFEE**	37.05
Compliance Check	See BREL	**% DFEE < TFEE**			-6.35
% DPER < TPER	-11.53	**DPER**	85.89	**TPER**	77.01

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0000	(1b)	x 2.7000	(2b) =	162.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	162.0000	(5)

---

2. Ventilation rate

---

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			12.3200	0.8687	10.7027			(27)
OPAQUE			3.9600	0.9000	3.5640			(26)
Doors			2.2000	0.9000	1.9800			(26)
External Wall 1	53.0600	18.4800	34.5800	0.1200	4.1496			(29a)
Exposed Internal Wall	8.3700		8.3700	0.1200	1.0044			(29a)
External Roof 1	60.0000		60.0000	0.1000	6.0000			(30)
Total net area of external elements Aum(A, m2)			121.4300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.4007			(33)
Main dwelling								
Party Wall 1			28.4800	0.0000	0.0000			(32)
Party Floor 1			60.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	14.3500	0.0700	1.0045	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.4000	0.0800	0.6720	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.5500	0.0000	0.0000	
E25 Staggered party wall between dwellings	8.1000	0.0800	0.6480	
E16 Corner (normal)	13.5000	0.0900	1.2150	
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860	
E14 Flat roof	12.0000	0.0800	0.9600	
E10 Eaves (insulation at ceiling level)	6.4000	0.1200	0.7680	
E12 Gable (insulation at ceiling level)	4.3500	0.4800	2.0880	
P4 Party wall - Roof (insulation at ceiling level)	10.5500	0.2400	2.5320	
E2 Other lintels (including other steel lintels)	8.4000	0.2000	1.6800	
E3 Sill	5.6000	0.0400	0.2240	
E4 Jamb	35.2000	0.0500	1.7600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.0655 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.4662 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3196	15.1492	14.9788	14.1268	13.9564	13.1044	13.1044	12.9340	13.4452	13.9564	14.2972	14.6380	(38)
Heat transfer coeff	55.7858	55.6154	55.4450	54.5930	54.4226	53.5706	53.5706	53.4002	53.9114	54.4226	54.7634	55.1042	(39)

Average = Sum(39)m / 12 = 54.5504

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9298	0.9269	0.9241	0.9099	0.9070	0.8928	0.8928	0.8900	0.8985	0.9070	0.9127	0.9184	(40)
HLP (average)												0.9092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9816 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	57.4451	56.5818	55.3238	52.9169	51.1406	49.1598	48.0339	49.2823	50.6509	52.7777	55.2363	57.2250	(42a)
Hot water usage for baths	24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)
Hot water usage for other uses	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)

Average daily hot water use (litres/day) 107.7295 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.1955	114.6935	111.6463	107.0121	103.2491	99.2034	97.6481	100.6821	103.8820	108.1293	112.8350	116.8914	(44)
Energy conte	185.6090	163.3220	171.5963	146.4943	138.9931	121.9821	118.0969	124.6655	128.0969	146.7305	160.7541	183.0237	(45)

Energy content (annual) Total = Sum(45)m = 1789.3645

Distribution loss (46)m = 0.15 x (45)m	27.8413	24.4983	25.7394	21.9741	20.8490	18.2973	17.7145	18.6998	19.2145	22.0096	24.1131	27.4536	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	236.5679	209.3494	222.5552	195.8093	189.9520	171.2972	169.0559	175.6244	177.4120	197.6894	210.0692	233.9827	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.5679	209.3494	222.5552	195.8093	189.9520	171.2972	169.0559	175.6244	177.4120	197.6894	210.0692	233.9827	(64)

Total per year (kWh/year) = Sum(64)m = 2389.3645 (64)

12Total per year (kWh/year) 2389 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month	74.4547	65.8114	69.7955	61.0381	58.9549	52.8878	52.0070	54.1910	54.9210	61.5276	65.7795	73.5951	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.6256	97.0140	87.6256	90.5464	87.6256	90.5464	87.6256	87.6256	90.5464	87.6256	90.5464	87.6256	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)	100.0735	97.9337	93.8111	84.7751	79.2405	73.4553	69.9018	72.8374	76.2792	82.6984	91.3604	98.9182	(72)
Total internal gains	416.3705	425.4138	407.3803	391.6374	371.0286	353.7419	339.6366	340.7775	351.6626	367.7888	391.5250	407.5843	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	75.3929	128.4219	175.7125	217.7163	243.8604	242.0969	233.4073	213.9026	190.2595	141.9336	90.3033	64.5206	(83)
Total gains	491.7634	553.8357	583.0928	609.3537	614.8890	595.8388	573.0439	554.6801	541.9221	509.7224	481.8283	472.1049	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.6904	74.9193	75.1495	76.3223	76.5613	77.7790	77.7790	78.0272	77.2873	76.5613	76.0849	75.6143	
alpha	5.9794	5.9946	6.0100	6.0882	6.1041	6.1853	6.1853	6.2018	6.1525	6.1041	6.0723	6.0410	
util living area	0.9895	0.9778	0.9555	0.8911	0.7639	0.5673	0.4103	0.4413	0.6636	0.9000	0.9762	0.9915	(86)
MIT	20.1717	20.3410	20.5401	20.7803	20.9319	20.9909	20.9989	20.9984	20.9769	20.7995	20.4569	20.1464	(87)
Th 2	20.1423	20.1447	20.1471	20.1591	20.1615	20.1736	20.1736	20.1760	20.1688	20.1615	20.1567	20.1519	(88)
util rest of house	0.9864	0.9715	0.9429	0.8626	0.7120	0.4976	0.3338	0.3631	0.5927	0.8680	0.9684	0.9890	(89)
MIT 2	19.1901	19.4045	19.6525	19.9457	20.1070	20.1686	20.1732	20.1754	20.1544	19.9745	19.5614	19.1655	(90)
Living area fraction										fLA = Living area / (4) =		0.4833	(91)
MIT	19.6645	19.8571	20.0815	20.3491	20.5057	20.5660	20.5723	20.5732	20.5519	20.3733	19.9942	19.6396	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5145	19.7071	19.9315	20.1991	20.3557	20.4160	20.4223	20.4232	20.4019	20.2233	19.8442	19.4896	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9835	0.9676	0.9392	0.8641	0.7246	0.5183	0.3569	0.3867	0.6132	0.8706	0.9648	0.9865	(94)
Useful gains	483.6706	535.8996	547.6234	526.5528	445.5584	308.8469	204.5376	214.4708	332.3152	443.7674	464.8683	465.7221	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	848.7559	823.5045	744.7086	616.8515	471.0676	311.5676	204.7641	214.8382	339.7454	523.7247	697.9182	842.5216	(97)
Space heating kWh	271.6235	193.2705	146.6314	65.0151	18.9788	0.0000	0.0000	0.0000	0.0000	59.4882	167.7959	280.3389	(98a)
Space heating requirement - total per year (kWh/year)												1203.1423	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	271.6235	193.2705	146.6314	65.0151	18.9788	0.0000	0.0000	0.0000	59.4882	167.7959	280.3389	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1203.1423	
Space heating per m2											(98c) / (4) =	20.0524	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.5000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	271.6235	193.2705	146.6314	65.0151	18.9788	0.0000	0.0000	0.0000	0.0000	59.4882	167.7959	280.3389	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	303.4899	215.9447	163.8340	72.6426	21.2054	0.0000	0.0000	0.0000	0.0000	66.4673	187.4815	313.2278	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	236.5679	209.3494	222.5552	195.8093	189.9520	171.2972	169.0559	175.6244	177.4120	197.6894	210.0692	233.9827	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	207.3843	182.4827	191.7277	163.6807	155.2996	136.2929	131.9519	139.2911	143.1250	163.9447	179.6135	204.4958	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	64.5462	58.2998	64.5462	62.4641	64.5462	62.4641	64.5462	64.5462	62.4641	64.5462	62.4641	64.5462	(231)
Lighting	18.2069	14.6062	13.1513	9.6352	7.4425	6.0806	6.7893	8.8250	11.4628	15.0398	16.9874	18.7129	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1344.2930	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	1999.2900	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	118.9793	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)

Total electricity for the above, kWh/year	759.9793	(231)
Electricity for lighting (calculated in Appendix L)	146.9398	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4250.5021	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1344.2930	0.2100	282.3015	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1999.2900	0.2100	419.8509	(264)
Space and water heating			702.1524	(265)
Pumps, fans and electric keep-hot	759.9793	0.1387	105.4185	(267)
Energy for lighting	146.9398	0.1443	21.2080	(268)
Total CO2, kg/year			828.7789	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.8100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1344.2930	1.1300	1519.0511	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1999.2900	1.1300	2259.1977	(278)
Space and water heating			3778.2488	(279)
Pumps, fans and electric keep-hot	759.9793	1.5128	1149.6967	(281)
Energy for lighting	146.9398	1.5338	225.3812	(282)
Total Primary energy kWh/year			5153.3266	(286)
Dwelling Primary energy Rate (DPER)			85.8900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0000	(1b) x	2.7000	(2b) =	162.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1235	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3735	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3174	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4047	0.3968	0.3889	0.3492	0.3412	0.3016	0.3016	0.2936	0.3174	0.3412	0.3571	0.3730	(22b)
Effective ac	0.5819	0.5787	0.5756	0.5610	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5638	0.5696	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			6.1600	1.0000	6.1600			(26)
TER Opening Type			8.8400	1.1450	10.1221			(27)
External Wall 1	53.0600	15.0000	38.0600	0.1800	6.8508			(29a)
Exposed Internal Wall	8.3700		8.3700	0.1800	1.5066			(29a)
External Roof 1	60.0000		60.0000	0.1100	6.6000			(30)
Total net area of external elements Aum(A, m2)			121.4300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2395			(33)
Main dwelling								
Party Wall 1			28.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	14.3500	0.0700	1.0045
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.4000	0.0200	0.1680
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.5500	0.0000	0.0000
E25 Staggered party wall between dwellings	8.1000	0.0600	0.4860
E16 Corner (normal)	13.5000	0.0900	1.2150
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
E14 Flat roof	12.0000	0.0800	0.9600
E10 Eaves (insulation at ceiling level)	6.4000	0.0600	0.3840
E12 Gable (insulation at ceiling level)	4.3500	0.0600	0.2610
P4 Party wall - Roof (insulation at ceiling level)	10.5500	0.1200	1.2660
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	35.2000	0.0500	1.7600

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.7185	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	38.9580	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.1086	30.9386	30.7719	29.9891	29.8427	29.1609	29.1609	29.0346	29.4235	29.8427	30.1390	30.4487	(38)
Heat transfer coeff	70.0667	69.8966	69.7300	68.9472	68.8007	68.1189	68.1189	67.9927	68.3815	68.8007	69.0970	69.4068	(39)
Average = Sum(39)m / 12 =												68.9465	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1678	1.1649	1.1622	1.1491	1.1467	1.1353	1.1353	1.1332	1.1397	1.1467	1.1516	1.1568	(40)
HLP (average)												1.1491	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9816	(42)

Hot water usage for mixer showers

57.4451	56.5818	55.3238	52.9169	51.1406	49.1598	48.0339	49.2823	50.6509	52.7777	55.2363	57.2250	(42a)

Hot water usage for baths

24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)

Hot water usage for other uses

34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)

Average daily hot water use (litres/day)	107.7295	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.1955	114.6935	111.6463	107.0121	103.2491	99.2034	97.6481	100.6821	103.8820	108.1293	112.8350	116.8914	(44)
Energy conte	185.6090	163.3220	171.5963	146.4943	138.9931	121.9821	118.0969	124.6655	128.0969	146.7305	160.7541	183.0237	(45)
Energy content (annual)										Total = Sum(45)m =		1789.3645	
Distribution loss (46)m = 0.15 x (45)m	27.8413	24.4983	25.7394	21.9741	20.8490	18.2973	17.7145	18.6998	19.2145	22.0096	24.1131	27.4536	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	48.9222	49.7604	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	236.5679	209.3494	222.5552	195.8093	189.9520	170.9044	167.8574	175.6244	177.4120	197.6894	210.0692	233.9827	(62)
WWHRS	-26.2615	-23.2259	-24.3208	-20.1386	-18.7684	-16.0603	-15.0540	-16.0084	-16.6166	-19.5891	-22.1921	-25.7752	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	210.3064	186.1236	198.2344	175.6707	171.1836	154.8441	152.8034	159.6160	160.7954	178.1003	187.8771	208.2075	(64)
										Total per year (kWh/year) = Sum(64)m =		2143.7625	(64)
12Total per year (kWh/year)												2144	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	74.4547	65.8114	69.7955	61.0381	58.9549	52.7896	51.7073	54.1910	54.9210	61.5276	65.7795	73.5951	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.5619	102.4793	92.5619	95.6473	92.5619	95.6473	92.5619	92.5619	95.6473	92.5619	95.6473	92.5619	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)	100.0735	97.9337	93.8111	84.7751	79.2405	73.3189	69.4991	72.8374	76.2792	82.6984	91.3604	98.9182	(72)
Total internal gains	421.3069	430.8790	412.3167	396.7383	375.9650	358.7064	344.1703	345.7139	356.7635	372.7252	396.6259	412.5207	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.4200	36.7938	0.6300	0.7000	0.7700	49.7015	(77)
Southwest	4.4200	36.7938	0.6300	0.7000	0.7700	49.7015	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	99.4029	169.3199	231.6709	287.0515	321.5216	319.1965	307.7395	282.0233	250.8506	187.1346	119.0618	85.0682	(83)
Total gains	520.7098	600.1990	643.9876	683.7898	697.4866	677.9029	651.9098	627.7372	607.6141	559.8598	515.6877	497.5889	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.4672	59.6118	59.7543	60.4327	60.5614	61.1675	61.1675	61.2811	60.9326	60.5614	60.3017	60.0326	
alpha	4.9645	4.9741	4.9836	5.0288	5.0374	5.0778	5.0778	5.0854	5.0622	5.0374	5.0201	5.0022	
util living area	0.9900	0.9790	0.9589	0.9050	0.7964	0.6169	0.4549	0.4909	0.7150	0.9182	0.9791	0.9919	(86)
MIT	19.8342	20.0419	20.2984	20.6151	20.8492	20.9682	20.9943	20.9917	20.9331	20.6398	20.1864	19.8000	(87)
Th 2	19.9459	19.9481	19.9504	19.9609	19.9629	19.9721	19.9721	19.9738	19.9685	19.9629	19.9589	19.9547	(88)
util rest of house	0.9868	0.9727	0.9462	0.8761	0.7392	0.5287	0.3512	0.3852	0.6306	0.8870	0.9716	0.9893	(89)
MIT 2	18.6150	18.8781	19.1988	19.5859	19.8415	19.9548	19.9704	19.9710	19.9268	19.6243	19.0709	18.5781	(90)
Living area fraction										fLA = Living area / (4) =		0.4833	(91)
MIT	19.2043	19.4406	19.7303	20.0834	20.3285	20.4446	20.4653	20.4644	20.4132	20.1152	19.6100	19.1687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2043	19.4406	19.7303	20.0834	20.3285	20.4446	20.4653	20.4644	20.4132	20.1152	19.6100	19.1687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9839	0.9688	0.9430	0.8799	0.7607	0.5704	0.4015	0.4364	0.6688	0.8922	0.9684	0.9867	(94)
Useful gains	512.3295	581.5014	607.2979	601.6916	530.5803	386.6623	261.7214	273.9474	406.3626	499.5265	499.4022	490.9857	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1044.2914	1016.3403	922.5477	771.0606	593.6499	398.1277	263.2997	276.3484	431.7066	654.6492	864.4048	1038.9269	(97)
Space heating kWh	395.7796	292.2117	234.5458	121.9457	46.9237	0.0000	0.0000	0.0000	0.0000	115.4113	262.8019	407.6682	(98a)
Space heating requirement - total per year (kWh/year)												1877.2880	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	395.7796	292.2117	234.5458	121.9457	46.9237	0.0000	0.0000	0.0000	0.0000	115.4113	262.8019	407.6682	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1877.2880	
Space heating per m2										(98c) / (4) =		31.2881	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	395.7796	292.2117	234.5458	121.9457	46.9237	0.0000	0.0000	0.0000	0.0000	115.4113	262.8019	407.6682	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	428.3329	316.2464	253.8374	131.9758	50.7833	0.0000	0.0000	0.0000	0.0000	124.9040	284.4176	441.1994	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	210.3064	186.1236	198.2344	175.6707	171.1836	154.8441	152.8034	159.6160	160.7954	178.1003	187.8771	208.2075	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.7147	85.3435	84.7428	83.6143	82.0067	80.3000	80.3000	80.3000	80.3000	83.4752	85.1005	85.7937	(217)
Fuel for water heating, kWh/month	245.3564	218.0875	233.9247	210.0966	208.7433	192.8320	190.2907	198.7747	200.2433	213.3570	220.7707	242.6839	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.2325	15.4291	13.8922	10.1780	7.8618	6.4231	7.1718	9.3221	12.1085	15.8871	17.9444	19.7671	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.5460	-29.9699	-44.5592	-51.8887	-57.5186	-54.2780	-53.6372	-49.8784	-43.4848	-35.0891	-22.9507	-17.6496	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.7380	-18.6510	-37.5687	-57.1519	-76.2683	-76.8687	-75.9406	-63.9572	-46.4469	-26.8844	-11.7364	-6.8880	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

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

Annual totals kWh/year		
Space heating fuel - main system 1	2031.6970	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2575.1608	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	155.2176	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.5501	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3859.5252	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2031.6970	0.2100	426.6564	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2575.1608	0.2100	540.7838	(264)
Space and water heating			967.4401	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	155.2176	0.1443	22.4027	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.4501	0.1339	-64.4474	
PV Unit electricity exported	-507.1000	0.1255	-63.6559	
Total			-128.1034	(269)
Total CO2, kg/year			873.6687	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2031.6970	1.1300	2295.8176	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2575.1608	1.1300	2909.9317	(278)
Space and water heating			5205.7492	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	155.2176	1.5338	238.0780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.4501	1.4947	-719.6171	
PV Unit electricity exported	-507.1000	0.4608	-233.6526	
Total			-953.2697	(283)
Total Primary energy kWh/year			4620.6583	(286)
Target Primary Energy Rate (TPER)			77.0100	(287)

Full SAP Calculation Printout

Property Reference	FLAT 21	**Issued on Date**	17/06/2025
Assessment Reference	Flat 21	**Prop Type Ref**	
Property			

SAP Rating	80 C	**DER**	14.93	**TER**	15.69
Environmental	89 B	**% DER < TER**			4.84
CO_2 Emissions (t/year)	0.88	**DFEE**	46.56	**TFEE**	45.13
Compliance Check	See BREL	**% DFEE < TFEE**			-3.17
% DPER < TPER	-9.66	**DPER**	90.99	**TPER**	82.97

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	67.2600	(1b)	x 2.7000	(2b) =	181.6020	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.2600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.6020	(5)

2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.2000	(23c)
Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			13.4000	0.8687	11.6409			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
Doord			2.2000	0.9000	1.9800			(26)
EXPOSED FLOOR			13.4100	0.0900	1.2069			(28b)
External Wall 1	66.2900	16.0400	50.2500	0.1200	6.0300			(29a)
Exposed Internal Wall	19.1700	2.2000	16.9700	0.1200	2.0364			(29a)
External Roof 1	67.2600		67.2600	0.1000	6.7260			(30)
Total net area of external elements Aum(A, m2)			166.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.9962			(33)
Main dwelling								
Party Wall 1			11.7000	0.0000	0.0000			(32)
Party Floor 1			53.8500					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.7000	0.0700	0.6090
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0500	0.0800	0.4840
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.3000	0.0000	0.0000
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
P8 Party Wall - Exposed floor (inverted)	9.1000	0.2400	2.1840
E20 Exposed floor (normal)	9.1000	0.3200	2.9120
E24 Eaves (insulation at ceiling level - inverted)	5.9500	0.2400	1.4280
E14 Flat roof	10.6500	0.0800	0.8520
E10 Eaves (insulation at ceiling level)	13.0000	0.1200	1.5600
E12 Gable (insulation at ceiling level)	8.0000	0.4800	3.8400
P4 Party wall - Roof (insulation at ceiling level)	4.3500	0.2400	1.0440
E2 Other lintels (including other steel lintels)	8.8000	0.2000	1.7600
E3 Sill	6.6000	0.0400	0.2640
E4 Jamb	33.6000	0.0500	1.6800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.5350 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.5312 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.1733	16.9823	16.7913	15.8361	15.6451	14.6900	14.6900	14.4990	15.0721	15.6451	16.0272	16.4092	(38)
Heat transfer coeff	68.7045	68.5135	68.3225	67.3674	67.1764	66.2212	66.2212	66.0302	66.6033	67.1764	67.5584	67.9404	(39)
Average = Sum(39)m / 12 =												67.3196	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0215	1.0186	1.0158	1.0016	0.9988	0.9846	0.9846	0.9817	0.9902	0.9988	1.0044	1.0101	(40)
HLP (average)												1.0009	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1778 (42)
Hot water usage for mixer showers

60.7344	59.8216	58.4916	55.9469	54.0689	51.9747	50.7843	52.1042	53.5511	55.7997	58.3991	60.5017	(42a)

Hot water usage for baths

26.2410	25.8513	25.3025	24.2906	23.5329	22.6927	22.2389	22.7839	23.3772	24.2762	25.3090	26.1523	(42b)

Hot water usage for other uses

36.9330	35.5899	34.2469	32.9039	31.5609	30.2179	30.2179	31.5609	32.9039	34.2469	35.5899	36.9330	(42c)

Average daily hot water use (litres/day) 113.9000 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.9083	121.2629	118.0410	113.1414	109.1627	104.8853	103.2411	106.4490	109.8323	114.3229	119.2981	123.5869	(44)
Energy conte	196.2405	172.6767	181.4247	154.8849	146.9540	128.9687	124.8611	131.8061	135.4342	155.1351	169.9620	193.5072	(45)
Energy content (annual)										Total = Sum(45)m =		1891.8551	
Distribution loss (46)m = 0.15 x (45)m	29.4361	25.9015	27.2137	23.2327	22.0431	19.3453	18.7292	19.7709	20.3151	23.2703	25.4943	29.0261	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	247.1994	218.7041	232.3836	204.2000	197.9129	178.2837	175.8200	182.7650	184.7493	206.0940	219.2770	244.4661	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	247.1994	218.7041	232.3836	204.2000	197.9129	178.2837	175.8200	182.7650	184.7493	206.0940	219.2770	244.4661	(64)
										Total per year (kWh/year) = Sum(64)m =		2491.8551	(64)
12Total per year (kWh/year)												2492	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	77.9897	68.9218	73.0634	63.8280	61.6019	55.2109	54.2561	56.5653	57.3606	64.3222	68.8411	77.0809	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	96.9641	107.3531	96.9641	100.1963	96.9641	100.1963	96.9641	96.9641	100.1963	96.9641	100.1963	96.9641	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.8195	192.7996	187.8098	177.1871	163.7778	151.1750	142.7555	140.7754	145.7652	156.3879	169.7972	182.4000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	(71)
Water heating gains (Table 5)	104.8248	102.5623	98.2035	88.6500	82.7983	76.6817	72.9248	76.0286	79.6675	86.4545	95.6127	103.6033	(72)
Total internal gains	451.2757	461.3822	441.6446	424.7005	402.2074	383.7202	368.3116	369.4353	381.2962	398.4738	424.2733	441.6347	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(77)
Southwest	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(79)

Northwest				1.9600		11.2829		0.3000		0.8000		0.7700	3.6781 (81)
Solar gains	73.6857	126.7358	176.6505	224.3179	256.2194	256.5504	246.4331	222.2993	193.1060	140.9450	88.4810	62.9157 (83)	
Total gains	524.9614	588.1180	618.2952	649.0184	658.4268	640.2705	614.7448	591.7346	574.4022	539.4188	512.7543	504.5504 (84)	

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.9844	68.1739	68.3645	69.3338	69.5309	70.5338	70.5338	70.7378	70.1292	69.5309	69.1377	68.7489	
alpha	5.5323	5.5449	5.5576	5.6223	5.6354	5.7023	5.7023	5.7159	5.6753	5.6354	5.6092	5.5833	
util living area	0.9928	0.9855	0.9713	0.9274	0.8261	0.6392	0.4704	0.5077	0.7418	0.9353	0.9845	0.9941	(86)
MIT	19.9781	20.1452	20.3627	20.6506	20.8676	20.9761	20.9964	20.9946	20.9451	20.6819	20.2890	19.9536	(87)
Th 2	20.0655	20.0678	20.0702	20.0820	20.0844	20.0962	20.0962	20.0986	20.0915	20.0844	20.0796	20.0749	(88)
util rest of house	0.9905	0.9811	0.9623	0.9045	0.7759	0.5584	0.3757	0.4112	0.6653	0.9102	0.9789	0.9923	(89)
MIT 2	18.8861	19.0994	19.3739	19.7325	19.9743	20.0827	20.0951	20.0967	20.0559	19.7771	19.2920	18.8622	(90)
Living area fraction										fLA = Living area / (4) =		0.5763	(91)
MIT	19.5154	19.7021	19.9437	20.2616	20.4891	20.5975	20.6145	20.6141	20.5683	20.2985	19.8665	19.4911	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3654	19.5521	19.7937	20.1116	20.3391	20.4475	20.4645	20.4641	20.4183	20.1485	19.7165	19.3411	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9883	0.9780	0.9590	0.9053	0.7909	0.5907	0.4146	0.4508	0.6943	0.9123	0.9761	0.9904	(94)
Useful gains	518.8398	575.1656	592.9737	587.5820	520.7740	378.2227	254.8987	266.7483	398.8140	492.1041	500.5188	499.6895	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.0605	1003.8649	908.2580	755.2967	580.3404	387.2313	255.9108	268.3535	420.8194	641.4322	852.3534	1028.6960	(97)
Space heating kWh	384.0682	288.0859	234.5715	120.7546	44.3174	0.0000	0.0000	0.0000	0.0000	111.1001	253.3209	393.5809	(98a)
Space heating requirement - total per year (kWh/year)												1829.7996	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	384.0682	288.0859	234.5715	120.7546	44.3174	0.0000	0.0000	0.0000	0.0000	111.1001	253.3209	393.5809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1829.7996	
Space heating per m2											(98c) / (4) =	27.2049	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	384.0682	288.0859	234.5715	120.7546	44.3174	0.0000	0.0000	0.0000	0.0000	111.1001	253.3209	393.5809	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	429.1265	321.8837	262.0911	134.9214	49.5167	0.0000	0.0000	0.0000	0.0000	124.1342	283.0401	439.7552	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	247.1994	218.7041	232.3836	204.2000	197.9129	178.2837	175.8200	182.7650	184.7493	206.0940	219.2770	244.4661	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	219.2631	192.9348	202.7091	173.0557	164.1944	144.0991	139.5096	147.2694	151.3231	173.3353	189.9016	216.2092	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	65.7689	59.4042	65.7689	63.6473	65.7689	63.6473	65.7689	65.7689	63.6473	65.7689	63.6473	65.7689	(231)
Lighting	20.1472	16.1629	14.5529	10.6620	8.2357	6.7286	7.5129	9.7655	12.6844	16.6426	18.7978	20.7072	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2044.4689	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2113.8046	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020)	133.3758	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	774.3758	(231)
Electricity for lighting (calculated in Appendix L)	162.5997	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5095.2489	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2044.4689	0.2100	429.3385	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2113.8046	0.2100	443.8990	(264)
Space and water heating			873.2374	(265)
Pumps, fans and electric keep-hot	774.3758	0.1387	107.4155	(267)
Energy for lighting	162.5997	0.1443	23.4682	(268)
Total CO2, kg/year			1004.1210	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.9300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2044.4689	1.1300	2310.2498	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2113.8046	1.1300	2388.5992	(278)
Space and water heating			4698.8490	(279)
Pumps, fans and electric keep-hot	774.3758	1.5128	1171.4757	(281)
Energy for lighting	162.5997	1.5338	249.4009	(282)
Total Primary energy kWh/year			6119.7255	(286)
Dwelling Primary energy Rate (DPER)			90.9900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	67.2600	(1b) x	2.7000	(2b) =	181.6020	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		181.6020	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1101	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3601	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3061	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3903	0.3826	0.3750	0.3367	0.3291	0.2908	0.2908	0.2832	0.3061	0.3291	0.3444	0.3597	(22b)
Effective ac	0.5762	0.5732	0.5703	0.5567	0.5541	0.5423	0.5423	0.5401	0.5469	0.5541	0.5593	0.5647	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			11.9800	1.1450	13.7176			(27)
EXPOSED FLOOR			13.4100	0.1300	1.7433			(28b)
External Wall 1	66.2900	14.6200	51.6700	0.1800	9.3006			(29a)
Exposed Internal Wall	19.1700	2.2000	16.9700	0.1800	3.0546			(29a)
External Roof 1	67.2600		67.2600	0.1100	7.3986			(30)
Total net area of external elements Aum(A, m2)			166.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.0547			(33)
Main dwelling								
Party Wall 1			11.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	8.7000	0.0700	0.6090	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0500	0.0200	0.1210	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.3000	0.0000	0.0000	
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240	
E16 Corner (normal)	10.8000	0.0900	0.9720	
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860	
P8 Party Wall - Exposed floor (inverted)	9.1000	0.2400	2.1840	
E20 Exposed floor (normal)	9.1000	0.3200	2.9120	
E24 Eaves (insulation at ceiling level - inverted)	5.9500	0.2400	1.4280	
E14 Flat roof	10.6500	0.0800	0.8520	
E10 Eaves (insulation at ceiling level)	13.0000	0.0600	0.7800	
E12 Gable (insulation at ceiling level)	8.0000	0.0600	0.4800	
P4 Party wall - Roof (insulation at ceiling level)	4.3500	0.1200	0.5220	
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400	
E3 Sill	6.6000	0.0500	0.3300	
E4 Jamb	33.6000	0.0500	1.6800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.1480 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.2027 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.5287	34.3515	34.1778	33.3617	33.2091	32.4984	32.4984	32.3667	32.7721	33.2091	33.5179	33.8408	(38)
Heat transfer coeff	87.7314	87.5541	87.3804	86.5644	86.4117	85.7010	85.7010	85.5694	85.9748	86.4117	86.7206	87.0435	(39)
Average = Sum(39)m / 12 =												86.5637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3044	1.3017	1.2991	1.2870	1.2847	1.2742	1.2742	1.2722	1.2782	1.2847	1.2893	1.2941	(40)
HLP (average)												1.2870	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.7344	59.8216	58.4916	55.9469	54.0689	51.9747	50.7843	52.1042	53.5511	55.7997	58.3991	60.5017	(42a)
Hot water usage for baths	26.2410	25.8513	25.3025	24.2906	23.5329	22.6927	22.2389	22.7839	23.3772	24.2762	25.3090	26.1523	(42b)
Hot water usage for other uses	36.9330	35.5899	34.2469	32.9039	31.5609	30.2179	30.2179	31.5609	32.9039	34.2469	35.5899	36.9330	(42c)
Average daily hot water use (litres/day)												113.9000	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.9083	121.2629	118.0410	113.1414	109.1627	104.8853	103.2411	106.4490	109.8323	114.3229	119.2981	123.5869	(44)
Energy conte	196.2405	172.6767	181.4247	154.8849	146.9540	128.9687	124.8611	131.8061	135.4342	155.1351	169.9620	193.5072	(45)
Energy content (annual)										Total = Sum(45)m =		1891.8551	
Distribution loss (46)m = 0.15 x (45)m	29.4361	25.9015	27.2137	23.2327	22.0431	19.3453	18.7292	19.7709	20.3151	23.2703	25.4943	29.0261	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	247.1994	218.7041	232.3836	204.2000	197.9129	178.2837	175.8200	182.7650	184.7493	206.0940	219.2770	244.4661	(62)
WWHRS	-27.7652	-24.5558	-25.7134	-21.2917	-19.8431	-16.9799	-15.9159	-16.9250	-17.5680	-20.7108	-23.4628	-27.2510	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.4342	194.1483	206.6702	182.9083	178.0698	161.3039	159.9041	165.8400	167.1812	185.3832	195.8142	217.2151	(64)
									Total per year (kWh/year) = Sum(64)m =			2233.8723	(64)
12Total per year (kWh/year)												2234	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	77.9897	68.9218	73.0634	63.8280	61.6019	55.2109	54.2561	56.5653	57.3606	64.3222	68.8411	77.0809	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	98.4696	109.0199	98.4696	101.7519	98.4696	101.7519	98.4696	98.4696	101.7519	98.4696	101.7519	98.4696	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.8195	192.7996	187.8098	177.1871	163.7778	151.1750	142.7555	140.7754	145.7652	156.3879	169.7972	182.4000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	(71)
Water heating gains (Table 5)													
	104.8248	102.5623	98.2035	88.6500	82.7983	76.6817	72.9248	76.0286	79.6675	86.4545	95.6127	103.6033	(72)
Total internal gains													
	452.7811	463.0490	443.1501	426.2562	403.7129	385.2758	369.8171	370.9407	382.8518	399.9792	425.8290	443.1401	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	8.2600	36.7938	0.6300	0.7000	0.7700	92.8810	(77)
Southwest	1.9700	36.7938	0.6300	0.7000	0.7700	22.1520	(79)
Northwest	1.7500	11.2829	0.6300	0.7000	0.7700	6.0344	(81)

Solar gains	121.0674	208.2269	290.2291	368.5318	420.9315	421.4704	404.8514	365.2111	317.2605	231.5706	145.3758	103.3723	(83)
Total gains	573.8485	671.2759	733.3792	794.7879	824.6444	806.7462	774.6685	736.1518	700.1123	631.5498	571.2048	546.5124	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.2402	53.3479	53.4540	53.9579	54.0532	54.5015	54.5015	54.5853	54.3280	54.0532	53.8607	53.6609	
alpha	4.5493	4.5565	4.5636	4.5972	4.6035	4.6334	4.6334	4.6390	4.6219	4.6035	4.5907	4.5774	
util living area													
	0.9914	0.9819	0.9635	0.9138	0.8108	0.6388	0.4777	0.5207	0.7481	0.9320	0.9827	0.9931	(86)
MIT	19.6107	19.8360	20.1305	20.5006	20.7900	20.9483	20.9891	20.9839	20.8918	20.5176	19.9988	19.5718	(87)
Th 2	19.8374	19.8395	19.8415	19.8510	19.8528	19.8611	19.8611	19.8627	19.8579	19.8528	19.8492	19.8454	(88)
util rest of house													
	0.9886	0.9761	0.9516	0.8854	0.7515	0.5416	0.3587	0.3989	0.6584	0.9033	0.9761	0.9908	(89)
MIT 2	18.2544	18.5404	18.9099	19.3636	19.6835	19.8332	19.8579	19.8574	19.7898	19.3955	18.7561	18.2106	(90)
Living area fraction										fLA = Living area / (4) =		0.5763	(91)
MIT	19.0360	19.2870	19.6133	20.0188	20.3211	20.4758	20.5098	20.5066	20.4248	20.0422	19.4722	18.9951	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0360	19.2870	19.6133	20.0188	20.3211	20.4758	20.5098	20.5066	20.4248	20.0422	19.4722	18.9951	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9860	0.9726	0.9487	0.8901	0.7774	0.5958	0.4274	0.4691	0.7056	0.9088	0.9733	0.9885	(94)
Useful gains	565.8306	652.9045	695.7907	707.4434	641.1101	480.6400	331.1231	345.3594	493.9856	573.9482	555.9700	540.2397	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1292.8106	1259.6444	1145.8441	962.4966	744.9660	503.5644	335.0721	351.3970	543.7765	815.9127	1072.9285	1287.8128	(97)
Space heating kWh													
	540.8731	407.7292	334.8397	183.6383	77.2688	0.0000	0.0000	0.0000	0.0000	180.0216	372.2101	556.1944	(98a)
Space heating requirement - total per year (kWh/year)												2652.7753	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	540.8731	407.7292	334.8397	183.6383	77.2688	0.0000	0.0000	0.0000	0.0000	180.0216	372.2101	556.1944	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2652.7753	
Space heating per m2											(98c) / (4) =	39.4406	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	540.8731	407.7292	334.8397	183.6383	77.2688	0.0000	0.0000	0.0000	0.0000	180.0216	372.2101	556.1944	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	585.3605	441.2654	362.3806	198.7427	83.6242	0.0000	0.0000	0.0000	0.0000	194.8286	402.8248	601.9420	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.4342	194.1483	206.6702	182.9083	178.0698	161.3039	159.9041	165.8400	167.1812	185.3832	195.8142	217.2151	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.2345	85.9313	85.4089	84.3900	82.7216	80.3000	80.3000	80.3000	80.3000	84.3186	85.7347	86.3041	(217)
Fuel for water heating, kWh/month													
	254.4622	225.9342	241.9772	216.7417	215.2640	200.8765	199.1334	206.5255	208.1958	219.8605	228.3955	251.6858	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.4600	16.4138	14.7788	10.8276	8.3635	6.8331	7.6295	9.9171	12.8814	16.9010	19.0897	21.0287	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-22.9209	-33.3779	-49.5429	-57.5886	-63.7396	-60.1015	-59.3751	-55.2488	-48.2342	-39.0141	-25.5777	-19.6949	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.9064	-21.1262	-42.5224	-64.6460	-86.2356	-86.9139	-85.8815	-72.3610	-52.5792	-30.4583	-13.3065	-7.8118	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2870.9689	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2669.0523	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	165.1242	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1108.1647	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4682.9807	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2870.9689	0.2100	602.9035	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2669.0523	0.2100	560.5010	(264)
Space and water heating			1163.4045	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	165.1242	0.1443	23.8325	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-534.4161	0.1339	-71.5591	
PV Unit electricity exported	-573.7486	0.1255	-72.0305	
Total			-143.5896	(269)
Total CO2, kg/year			1055.5767	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.6900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2870.9689	1.1300	3244.1949	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2669.0523	1.1300	3016.0291	(278)
Space and water heating			6260.2240	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	165.1242	1.5338	253.2730	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-534.4161	1.4948	-798.8657	
PV Unit electricity exported	-573.7486	0.4608	-264.3920	
Total			-1063.2577	(283)
Total Primary energy kWh/year			5580.3401	(286)
Target Primary Energy Rate (TPER)			82.9700	(287)

Full SAP Calculation Printout

Property Reference	Studio	**Issued on Date**	17/06/2025
Assessment Reference	Studio	**Prop Type Ref**	
Property			

SAP Rating	75 C	**DER**	24.56	**TER**	31.48
Environmental	89 B	**% DER < TER**			21.98
CO_2 Emissions (t/year)	0.5	**DFEE**	61.75	**TFEE**	75.92
Compliance Check	See BREL	**% DFEE < TFEE**			18.66
% DPER < TPER	6.74	**DPER**	157.99	**TPER**	169.42

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	22.6900	(1b)	x 2.7000	(2b) =	61.2630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	22.6900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	61.2630	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			5.9400	0.8687	5.1602			(27)
Door to Corridor			2.2000	0.9000	1.9800			(26)
Ground Floor			22.6900	0.0900	2.0421			(28a)
External Wall	17.6600	6.1600	11.5000	0.1200	1.3800			(29a)
Internal Exposed Wall	35.5300	1.9800	33.5500	0.1200	4.0260			(29a)
External Roof 1	6.4000		6.4000	0.1000	0.6400			(30)
Total net area of external elements Aum(A, m2)			82.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.2283			(33)
Main dwelling								
Party Ceiling 1			16.2900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	19.7000	0.1300	2.5610

E16 Corner (normal)	10.8000	0.0900	0.9720
P8 Party Wall - Exposed floor (inverted)	12.5500	0.2400	3.0120
E14 Flat roof	3.5000	0.0800	0.2800
E15 Flat roof with parapet	3.6500	0.0800	0.2920
E24 Eaves (insulation at ceiling level - inverted)	3.6600	0.2400	0.8784
E2 Other lintels (including other steel lintels)	3.7000	0.2000	0.7400
E3 Sill	2.7000	0.0400	0.1080
E4 Jamb	17.6000	0.0500	0.8800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7234 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.9517 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	5.5034	5.4446	5.3859	5.0921	5.0333	4.7396	4.7396	4.6808	4.8571	5.0333	5.1509	5.2684	(38)
Heat transfer coeff	30.4551	30.3964	30.3376	30.0438	29.9851	29.6913	29.6913	29.6326	29.8088	29.9851	30.1026	30.2201	(39)

Average = Sum(39)m / 12 = 30.0291

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3422	1.3396	1.3370	1.3241	1.3215	1.3086	1.3086	1.3060	1.3137	1.3215	1.3267	1.3319	(40)
HLP (average)												1.3235	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.0583 (42)
Hot water usage for mixer showers

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

Hot water usage for baths

48.2754	47.5585	46.5488	44.6873	43.2933	41.7477	40.9128	41.9154	43.0070	44.6609	46.5608	48.1122	(42b)

Hot water usage for other uses

25.4676	24.5415	23.6154	22.6893	21.7632	20.8371	20.8371	21.7632	22.6893	23.6154	24.5415	25.4676	(42c)

Average daily hot water use (litres/day) 67.9112 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.7430	72.0999	70.1642	67.3765	65.0565	62.5848	61.7499	63.6786	65.6963	68.2762	71.1022	73.5798	(44)
Energy conte	116.7908	102.6693	107.8398	92.2351	87.5786	76.9553	74.6812	78.8474	81.0101	92.6502	101.2982	115.2081	(45)
Energy content (annual)										Total = Sum(45)m =		1127.7640	
Distribution loss (46)m = 0.15 x (45)m	17.5186	15.4004	16.1760	13.8353	13.1368	11.5433	11.2022	11.8271	12.1515	13.8975	15.1947	17.2812	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	167.7497	148.6967	158.7987	141.5502	138.5375	126.2704	125.6401	129.8063	130.3251	143.6091	150.6133	166.1670	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	167.7497	148.6967	158.7987	141.5502	138.5375	126.2704	125.6401	129.8063	130.3251	143.6091	150.6133	166.1670	(64)
										Total per year (kWh/year) = Sum(64)m =		1727.7640	(64)
12Total per year (kWh/year)												1728	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	51.5727	45.6444	48.5964	42.9969	41.8596	37.9164	37.5712	38.9565	39.2646	43.5459	46.0104	51.0464	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.0364	45.4332	41.0364	42.4043	41.0364	42.4043	41.0364	41.0364	42.4043	41.0364	42.4043	41.0364	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	81.3593	82.2035	80.0760	75.5469	69.8296	64.4561	60.8663	60.0221	62.1496	66.6788	72.3961	77.7695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	(71)
Water heating gains (Table 5)	69.3181	67.9232	65.3178	59.7180	56.2629	52.6617	50.4989	52.3609	54.5342	58.5295	63.9034	68.6108	(72)
Total internal gains	233.5876	237.4337	228.3040	219.5429	209.0027	198.3959	191.2755	192.2931	197.9618	208.1184	220.5775	229.2905	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.9800	36.7938	0.3000	0.8000	0.7700	12.1167	(77)
Southwest	1.9800	36.7938	0.3000	0.8000	0.7700	12.1167	(79)
Northwest	1.9800	11.2829	0.3000	0.8000	0.7700	3.7156	(81)

Solar gains	27.9490	48.8417	70.1056	92.3590	108.4652	109.8869	105.0246	92.6714	77.7590	54.8644	33.7013	23.7731	(83)
Total gains	261.5366	286.2754	298.4096	311.9019	317.4678	308.2828	296.3001	284.9646	275.7209	262.9828	254.2787	253.0636	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.7382	51.8383	51.9386	52.4465	52.5493	53.0692	53.0692	53.1744	52.8600	52.5493	52.3441	52.1406	
alpha	4.4492	4.4559	4.4626	4.4964	4.5033	4.5379	4.5379	4.5450	4.5240	4.5033	4.4896	4.4760	
util living area	0.9741	0.9598	0.9353	0.8747	0.7616	0.5881	0.4348	0.4694	0.6832	0.8805	0.9552	0.9773	(86)
MIT	19.8414	20.0199	20.2654	20.5846	20.8301	20.9600	20.9918	20.9884	20.9206	20.6321	20.1965	19.8093	(87)
Th 2	19.8079	19.8099	19.8119	19.8220	19.8240	19.8341	19.8341	19.8362	19.8301	19.8240	19.8200	19.8160	(88)
util rest of house	0.9665	0.9482	0.9163	0.8382	0.6967	0.4927	0.3228	0.3552	0.5904	0.8383	0.9402	0.9705	(89)
MIT 2	18.5221	18.7448	19.0473	19.4300	19.6922	19.8134	19.8318	19.8326	19.7829	19.4941	18.9752	18.4880	(90)
Living area fraction									fLA = Living area / (4) =			1.0000	(91)
MIT	19.8414	20.0199	20.2654	20.5846	20.8301	20.9600	20.9918	20.9884	20.9206	20.6321	20.1965	19.8093	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6914	19.8699	20.1154	20.4346	20.6801	20.8100	20.8418	20.8384	20.7706	20.4821	20.0465	19.6593	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9656	0.9489	0.9217	0.8583	0.7452	0.5733	0.4200	0.4540	0.6663	0.8635	0.9435	0.9695	(94)
Useful gains	252.5415	271.6422	275.0415	267.7186	236.5904	176.7482	124.4382	129.3822	183.7213	227.0836	239.9062	245.3364	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	468.7454	455.0306	413.0586	346.5432	269.2702	184.3834	125.9432	131.5200	198.8431	296.3169	389.7230	467.1808	(97)
Space heating kWh	160.8557	123.2370	102.6847	56.7538	24.3138	0.0000	0.0000	0.0000	0.0000	51.5096	107.8681	165.0522	(98a)
Space heating requirement - total per year (kWh/year)												792.2749	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	160.8557	123.2370	102.6847	56.7538	24.3138	0.0000	0.0000	0.0000	0.0000	51.5096	107.8681	165.0522	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												792.2749	
Space heating per m2										(98c) / (4) =		34.9174	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 89.5000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	160.8557	123.2370	102.6847	56.7538	24.3138	0.0000	0.0000	0.0000	0.0000	51.5096	107.8681	165.0522	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	179.7271	137.6950	114.7315	63.4120	27.1662	0.0000	0.0000	0.0000	0.0000	57.5526	120.5231	184.4159	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	167.7497	148.6967	158.7987	141.5502	138.5375	126.2704	125.6401	129.8063	130.3251	143.6091	150.6133	166.1670	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	130.4925	114.7143	120.4913	103.0560	97.8532	85.9836	83.4426	88.0976	90.5140	103.5198	113.1823	128.7242	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	57.9959	52.3834	57.9959	56.1251	57.9959	56.1251	57.9959	57.9959	56.1251	57.9959	56.1251	57.9959	(231)
Lighting	10.3120	8.2727	7.4486	5.4572	4.2153	3.4439	3.8453	4.9983	6.4923	8.5182	9.6213	10.5986	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 885.2234 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 89.5000
Water heating fuel used 1260.0715 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.5600)
mechanical ventilation fans (SFP = 0.5600) 41.8549 (230a)
central heating pump 41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)
Total electricity for the above, kWh/year 682.8549 (231)
Electricity for lighting (calculated in Appendix L) 83.2236 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2911.3734	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	885.2234	0.2100	185.8969	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1260.0715	0.2100	264.6150	(264)
Space and water heating			450.5119	(265)
Pumps, fans and electric keep-hot	682.8549	0.1387	94.7204	(267)
Energy for lighting	83.2236	0.1443	12.0117	(268)
Total CO2, kg/year			557.2441	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			24.5600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	885.2234	1.1300	1000.3024	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1260.0715	1.1300	1423.8808	(278)
Space and water heating			2424.1833	(279)
Pumps, fans and electric keep-hot	682.8549	1.5128	1033.0229	(281)
Energy for lighting	83.2236	1.5338	127.6512	(282)
Total Primary energy kWh/year			3584.8573	(286)
Dwelling Primary energy Rate (DPER)			157.9900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	22.6900	(1b)	x 2.7000	(2b) =	61.2630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	22.6900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		61.2630	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.3265	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.5765	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5696	0.5584	0.5473	0.4914	0.4803	0.4244	0.4244	0.4133	0.4468	0.4803	0.5026	0.5249	(22b)
Effective ac	0.6622	0.6559	0.6498	0.6208	0.6153	0.5901	0.5901	0.5854	0.5998	0.6153	0.6263	0.6378	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type			3.4800	1.1450	3.9847			(27)
Ground Floor			22.6900	0.1300	2.9497			(28a)

External Wall	17.6600	4.5200	13.1400	0.1800	2.3652		(29a)
Internal Exposed Wall	35.5300	1.1600	34.3700	0.1800	6.1866		(29a)
External Roof 1	6.4000		6.4000	0.1100	0.7040		(30)
Total net area of external elements Aum(A, m2)			82.2800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.3902		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E5 Ground floor (normal)	19.7000	0.1600	3.1520	
E16 Corner (normal)	10.8000	0.0900	0.9720	
P8 Party Wall - Exposed floor (inverted)	12.5500	0.2400	3.0120	
E14 Flat roof	3.5000	0.0800	0.2800	
E15 Flat roof with parapet	3.6500	0.5600	2.0440	
E24 Eaves (insulation at ceiling level - inverted)	3.6600	0.2400	0.8784	
E2 Other lintels (including other steel lintels)	3.7000	0.0500	0.1850	
E3 Sill	2.7000	0.0500	0.1350	
E4 Jamb	17.6000	0.0500	0.8800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.5384 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	29.9286 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.3882	13.2608	13.1360	12.5496	12.4399	11.9292	11.9292	11.8347	12.1260	12.4399	12.6619	12.8939	(38)
Heat transfer coeff	43.3168	43.1895	43.0646	42.4783	42.3686	41.8579	41.8579	41.7633	42.0546	42.3686	42.5905	42.8225	(39)
Average = Sum(39)m / 12 =												42.4777	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9091	1.9035	1.8980	1.8721	1.8673	1.8448	1.8448	1.8406	1.8534	1.8673	1.8771	1.8873	(40)
HLP (average)												1.8721	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.0583 (42)

Hot water usage for mixer showers

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

Hot water usage for baths

48.2754	47.5585	46.5488	44.6873	43.2933	41.7477	40.9128	41.9154	43.0070	44.6609	46.5608	48.1122	(42b)

Hot water usage for other uses

25.4676	24.5415	23.6154	22.6893	21.7632	20.8371	20.8371	21.7632	22.6893	23.6154	24.5415	25.4676	(42c)

Average daily hot water use (litres/day) 67.9112 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.7430	72.0999	70.1642	67.3765	65.0565	62.5848	61.7499	63.6786	65.6963	68.2762	71.1022	73.5798	(44)
Energy conte	116.7908	102.6693	107.8398	92.2351	87.5786	76.9553	74.6812	78.8474	81.0101	92.6502	101.2982	115.2081	(45)
Energy content (annual)										Total = Sum(45)m =		1127.7640	
Distribution loss (46)m = 0.15 x (45)m	17.5186	15.4004	16.1760	13.8353	13.1368	11.5433	11.2022	11.8271	12.1515	13.8975	15.1947	17.2812	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	37.5786	33.1857	35.7549	33.2268	33.1521	30.8637	31.4671	32.4499	32.3982	34.7928	35.0641	37.4954	(61)
Total heat required for water heating calculated for each month	154.3694	135.8550	143.5947	125.4619	120.7307	107.8190	106.1482	111.2973	113.4082	127.4431	136.3623	152.7036	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	154.3694	135.8550	143.5947	125.4619	120.7307	107.8190	106.1482	111.2973	113.4082	127.4431	136.3623	152.7036	(64)
										Total per year (kWh/year) = Sum(64)m =		1535.1934	(64)
12Total per year (kWh/year)												1535	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	48.2276	42.4340	44.7954	38.9749	37.4079	33.3036	32.6983	34.3292	35.0354	39.5044	42.4477	47.6806	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.1796	47.8059	43.1796	44.6189	43.1796	44.6189	43.1796	43.1796	44.6189	43.1796	44.6189	43.1796	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	81.3593	82.2035	80.0760	75.5469	69.8296	64.4561	60.8663	60.0221	62.1496	66.6788	72.3961	77.7695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	(71)
Water heating gains (Table 5)	64.8220	63.1458	60.2089	54.1318	50.2794	46.2550	43.9493	46.1414	48.6603	53.0973	58.9551	64.0868	(72)
Total internal gains	231.2347	235.0290	225.3383	216.1713	205.1623	194.2037	186.8689	188.2169	194.3025	204.8294	217.8438	226.9096	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.1600	36.7938	0.6300	0.7000	0.7700	13.0438	(77)

Southwest				1.1600		36.7938		0.6300		0.7000		0.7700	13.0438 (79)
Northwest				1.1600		11.2829		0.6300		0.7000		0.7700	3.9999 (81)
Solar gains	30.0876	52.5789	75.4698	99.4259	116.7644	118.2949	113.0606	99.7622	83.7088	59.0624	36.2799	25.5921 (83)	
Total gains	261.3222	287.6079	300.8080	315.5971	321.9267	312.4987	299.9295	287.9791	278.0113	263.8918	254.1237	252.5017 (84)	

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.3760	36.4833	36.5891	37.0941	37.1902	37.6439	37.6439	37.7292	37.4678	37.1902	36.9964	36.7959	
alpha	3.4251	3.4322	3.4393	3.4729	3.4793	3.5096	3.5096	3.5153	3.4979	3.4793	3.4664	3.4531	
util living area	0.9802	0.9711	0.9563	0.9200	0.8479	0.7149	0.5659	0.6033	0.7940	0.9251	0.9689	0.9824	(86)
MIT	19.0607	19.2716	19.5996	20.0663	20.4941	20.8135	20.9395	20.9229	20.7092	20.1789	19.5574	19.0367	(87)
Th 2	20.0455	20.0483	20.0510	20.0639	20.0664	20.0776	20.0776	20.0797	20.0733	20.0664	20.0615	20.0564	(88)
util rest of house	0.9766	0.9657	0.9476	0.9030	0.8126	0.6461	0.4648	0.5046	0.7367	0.9059	0.9622	0.9791	(89)
MIT 2	18.2738	18.4842	18.8098	19.2738	19.6783	19.9628	20.0518	20.0446	19.8790	19.3893	18.7785	18.2579	(90)
Living area fraction										fLA = Living area / (4) =		1.0000	(91)
MIT	19.0607	19.2716	19.5996	20.0663	20.4941	20.8135	20.9395	20.9229	20.7092	20.1789	19.5574	19.0367	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0607	19.2716	19.5996	20.0663	20.4941	20.8135	20.9395	20.9229	20.7092	20.1789	19.5574	19.0367	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9719	0.9604	0.9428	0.9030	0.8298	0.7021	0.5597	0.5957	0.7776	0.9085	0.9578	0.9747	(94)
Useful gains	253.9703	276.2200	283.6031	284.9939	267.1287	219.4075	167.8839	171.5504	216.1772	239.7338	243.4026	246.1093	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	639.3878	620.7006	564.1314	474.3247	372.5949	260.0822	181.6402	188.8927	277.9487	405.8428	530.5648	635.3453	(97)
Space heating kWh	286.7506	231.4909	208.7130	136.3181	78.4669	0.0000	0.0000	0.0000	0.0000	123.5850	206.7568	289.5916	(98a)
Space heating requirement - total per year (kWh/year)												1561.6730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	286.7506	231.4909	208.7130	136.3181	78.4669	0.0000	0.0000	0.0000	0.0000	123.5850	206.7568	289.5916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.6730	
Space heating per m2											(98c) / (4) =	68.8265	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	286.7506	231.4909	208.7130	136.3181	78.4669	0.0000	0.0000	0.0000	0.0000	123.5850	206.7568	289.5916	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	310.3362	250.5313	225.8799	147.5305	84.9209	0.0000	0.0000	0.0000	0.0000	133.7500	223.7628	313.4108	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	154.3694	135.8550	143.5947	125.4619	120.7307	107.8190	106.1482	111.2973	113.4082	127.4431	136.3623	152.7036	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.6885	85.5130	85.1817	84.5597	83.4812	80.3000	80.3000	80.3000	80.3000	84.3156	85.2706	85.7300	(217)
Fuel for water heating, kWh/month	180.1519	158.8706	168.5746	148.3708	144.6202	134.2703	132.1896	138.6018	141.2307	151.1501	159.9171	178.1214	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	8.9719	7.1976	6.4806	4.7480	3.6675	2.9964	3.3456	4.3487	5.6486	7.4112	8.3709	9.2212	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.1805	-12.1598	-18.4334	-21.9249	-24.7454	-23.5564	-23.3207	-21.4908	-18.4167	-14.4720	-9.2307	-7.0049	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.8937	-6.2270	-12.6246	-19.3106	-25.8483	-26.0389	-25.6813	-21.5581	-15.5925	-8.9643	-3.8868	-2.2744	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1690.1223	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												1836.0690	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	72.4080	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-373.8367	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3310.7627	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1690.1223	0.2100	354.9257	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1836.0690	0.2100	385.5745	(264)
Space and water heating			740.5002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	72.4080	0.1443	10.4507	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-202.9361	0.1334	-27.0739	
PV Unit electricity exported	-170.9007	0.1254	-21.4335	
Total			-48.5074	(269)
Total CO2, kg/year			714.3728	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			31.4800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1690.1223	1.1300	1909.8382	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1836.0690	1.1300	2074.7580	(278)
Space and water heating			3984.5962	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	72.4080	1.5338	111.0619	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-202.9361	1.4930	-302.9830	
PV Unit electricity exported	-170.9007	0.4603	-78.6724	
Total			-381.6554	(283)
Total Primary energy kWh/year			3844.1035	(286)
Target Primary Energy Rate (TPER)			169.4200	(287)

Full SAP Calculation Printout

Property Reference	FLAT 1	**Issued on Date**	17/06/2025
Assessment Reference	Flat 1	**Prop Type Ref**	
Property			

SAP Rating	79 C	**DER**	15.88	**TER**	18.87
Environmental	89 B	**% DER < TER**			15.85
CO_2 Emissions (t/year)	0.71	**DFEE**	45.45	**TFEE**	52.39
Compliance Check	See BREL	**% DFEE < TFEE**			13.25
% DPER < TPER	1.74	**DPER**	98.57	**TPER**	100.31

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.5660	(5)

---

2. Ventilation rate

---

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			9.9000	0.8687	8.6004			(27)
Door to Corridors			2.2000	0.9000	1.9800			(26)
Opaque			2.6400	0.9000	2.3760			(26)
Ground Floor			50.5800	0.0900	4.5522			(28a)
External Wall	52.1900	12.5400	39.6500	0.1200	4.7580			(29a)
Internal Exposed Wall	30.9000	2.2000	28.7000	0.1200	3.4440			(29a)
Total net area of external elements Aum(A, m2)			133.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7106			(33)
Main dwelling								
Party Ceiling 1			50.5800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.6000	0.1300	3.9780

E7 Party floor between dwellings (in blocks of flats)	18.1000	0.0700	1.2670	
E16 Corner (normal)	13.5000	0.0900	1.2150	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.6000	0.0800	0.4480	
P8 Party Wall - Exposed floor (inverted)	6.9000	0.2400	1.6560	
E2 Other lintels (including other steel lintels)	7.1000	0.2000	1.4200	
E3 Sill	4.9000	0.0400	0.1960	
E4 Jamb	29.2000	0.0500	1.4600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.3970 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.1076 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9144	12.7708	12.6271	11.9089	11.7652	11.0470	11.0470	10.9033	11.3343	11.7652	12.0525	12.3398	(38)
Heat transfer coeff	50.0220	49.8784	49.7347	49.0165	48.8728	48.1546	48.1546	48.0109	48.4419	48.8728	49.1601	49.4474	(39)
Average = Sum(39)m / 12 =												48.9806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9890	0.9861	0.9833	0.9691	0.9662	0.9520	0.9520	0.9492	0.9577	0.9662	0.9719	0.9776	(40)
HLP (average)												0.9684	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)
Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(64)
										Total per year (kWh/year) = Sum(64)m =		2245.9825	(64)
12Total per year (kWh/year)												2246	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.5094	61.4600	65.2237	57.1351	55.2518	49.6380	48.8605	50.8695	51.5080	57.6181	61.4964	68.7186	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.7321	83.8463	75.7321	78.2566	75.7321	78.2566	75.7321	75.7321	78.2566	75.7321	78.2566	75.7321	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	93.4266	91.4583	87.6663	79.3543	74.2632	68.9416	65.6728	68.3730	71.5389	77.4437	85.4117	92.3638	(72)
Total internal gains	369.5068	377.1962	361.4005	347.3327	329.2649	313.6441	301.2880	302.4447	312.0245	326.6852	347.6298	361.8811	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.5400	36.7938	0.3000	0.8000	0.7700	9.4241	(77)
Southwest	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(79)
Northwest	6.1600	11.2829	0.3000	0.8000	0.7700	11.5597	(81)

Solar gains	34.4468	62.5154	95.7351	135.7153	167.6159	173.2672	164.1918	139.3433	109.4149	71.8427	41.9586	29.0269	(83)
Total gains	403.9536	439.7115	457.1356	483.0480	496.8808	486.9112	465.4798	441.7880	421.4394	398.5279	389.5884	390.9080	(84)

---

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	70.2191	70.4213	70.6247	71.6596	71.8702	72.9422	72.9422	73.1604	72.5096	71.8702	71.4502	71.0350	
alpha	5.6813	5.6948	5.7083	5.7773	5.7913	5.8628	5.8628	5.8774	5.8340	5.7913	5.7633	5.7357	
util living area	0.9916	0.9851	0.9715	0.9245	0.8122	0.6163	0.4527	0.4956	0.7397	0.9347	0.9828	0.9929	(86)
MIT	20.0507	20.1920	20.3945	20.6789	20.8883	20.9822	20.9975	20.9958	20.9506	20.7023	20.3419	20.0316	(87)
Th 2	20.0925	20.0949	20.0973	20.1092	20.1116	20.1235	20.1235	20.1259	20.1187	20.1116	20.1068	20.1020	(88)
util rest of house	0.9891	0.9806	0.9626	0.9014	0.7615	0.5390	0.3639	0.4037	0.6648	0.9098	0.9767	0.9908	(89)
MIT 2	18.9986	19.1790	19.4348	19.7885	20.0195	20.1135	20.1227	20.1244	20.0866	19.8238	19.3791	18.9817	(90)
Living area fraction										fLA = Living area / (4) =		0.5045	(91)
MIT	19.5294	19.6901	19.9190	20.2378	20.4579	20.5518	20.5640	20.5641	20.5225	20.2670	19.8649	19.5115	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3794	19.5401	19.7690	20.0878	20.3079	20.4018	20.4140	20.4141	20.3725	20.1170	19.7149	19.3615	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9864	0.9771	0.9587	0.9007	0.7735	0.5642	0.3935	0.4343	0.6876	0.9100	0.9733	0.9884	(94)
Useful gains	398.4684	429.6378	438.2532	435.0991	384.3576	274.6937	183.1864	191.8879	289.7743	362.6475	379.2019	386.3857	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	754.3037	730.2247	659.9309	548.3848	420.6903	279.3832	183.6638	192.7196	303.8527	465.1238	620.1485	749.6954	(97)
Space heating kWh	264.7414	201.9944	164.9283	81.5657	27.0315	0.0000	0.0000	0.0000	0.0000	76.2424	173.4816	270.3024	(98a)
Space heating requirement - total per year (kWh/year)												1260.2877	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	264.7414	201.9944	164.9283	81.5657	27.0315	0.0000	0.0000	0.0000	0.0000	76.2424	173.4816	270.3024	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1260.2877	
Space heating per m2											(98c) / (4) =	24.9167	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.5000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	264.7414	201.9944	164.9283	81.5657	27.0315	0.0000	0.0000	0.0000	0.0000	76.2424	173.4816	270.3024	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	295.8005	225.6921	184.2774	91.1348	30.2028	0.0000	0.0000	0.0000	0.0000	85.1870	193.8342	302.0139	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.6946	196.2625	208.8055	184.0710	178.8149	161.5232	159.5929	165.6349	167.1473	185.9315	197.1876	219.3165	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	190.7662	167.8604	176.3649	150.5653	142.8558	125.3722	121.3788	128.1296	131.6561	150.8074	165.2207	188.1091	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	62.9597	56.8668	62.9597	60.9287	62.9597	60.9287	62.9597	62.9597	60.9287	62.9597	60.9287	62.9597	(231)
Lighting	15.7356	12.6237	11.3663	8.3274	6.4323	5.2553	5.8678	7.6272	9.9069	12.9984	14.6817	16.1730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1408.1427	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	1839.0866	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	100.2995	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	741.2995	(231)
Electricity for lighting (calculated in Appendix L)	126.9957	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4115.5244	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1408.1427	0.2100	295.7100	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1839.0866	0.2100	386.2082	(264)
Space and water heating			681.9181	(265)
Pumps, fans and electric keep-hot	741.2995	0.1387	102.8274	(267)
Energy for lighting	126.9957	0.1443	18.3294	(268)
Total CO2, kg/year			803.0749	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.8800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1408.1427	1.1300	1591.2012	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1839.0866	1.1300	2078.1678	(278)
Space and water heating			3669.3690	(279)
Pumps, fans and electric keep-hot	741.2995	1.5128	1121.4379	(281)
Energy for lighting	126.9957	1.5338	194.7902	(282)
Total Primary energy kWh/year			4985.5972	(286)
Dwelling Primary energy Rate (DPER)			98.5700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	136.5660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1464	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3964	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3370	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4297	0.4212	0.4128	0.3707	0.3623	0.3201	0.3201	0.3117	0.3370	0.3623	0.3791	0.3960	(22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5568	0.5656	0.5719	0.5784	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			7.8000	1.1450	8.9313			(27)
Ground Floor			50.5800	0.1300	6.5754			(28a)

External Wall	52.1900	10.4400	41.7500	0.1800	7.5150	(29a)
Internal Exposed Wall	30.9000	2.2000	28.7000	0.1800	5.1660	(29a)

Total net area of external elements Aum(A, m2) 133.6700 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 33.0277 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.6000	0.1600	4.8960
E7 Party floor between dwellings (in blocks of flats)	18.1000	0.0700	1.2670
E16 Corner (normal)	13.5000	0.0900	1.2150
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.6000	0.0200	0.1120
P8 Party Wall - Exposed floor (inverted)	6.9000	0.2400	1.6560
E2 Other lintels (including other steel lintels)	7.1000	0.0500	0.3550
E3 Sill	4.9000	0.0500	0.2450
E4 Jamb	29.2000	0.0500	1.4600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9630 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.9907 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.6931	26.5315	26.3732	25.6296	25.4904	24.8427	24.8427	24.7228	25.0922	25.4904	25.7719	26.0662	(38)
Heat transfer coeff	70.6838	70.5222	70.3639	69.6203	69.4811	68.8334	68.8334	68.7135	69.0829	69.4811	69.7626	70.0569	(39)

Average = Sum(39)m / 12 = 69.6196

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3975	1.3943	1.3911	1.3764	1.3737	1.3609	1.3609	1.3585	1.3658	1.3737	1.3793	1.3851	(40)
HLP (average)												1.3764	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---
4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)
Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)

Energy content (annual) Total = Sum(45)m = 1645.9825
Distribution loss (46)m = 0.15 x (45)m

25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)

Water storage loss:
Total storage loss

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

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	48.5445	48.3987	45.0023	45.7732	47.1953	47.1244	50.6861	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

221.6946	196.2625	208.8055	183.3004	176.2547	157.2104	154.4072	161.8713	164.9566	185.6587	197.1876	219.3165	(62)
WWHRS -24.1578	-21.3654	-22.3726	-18.5254	-17.2650	-14.7738	-13.8481	-14.7260	-15.2855	-18.0199	-20.4144	-23.7104	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

197.5368	174.8971	186.4329	164.7750	158.9897	142.4366	140.5591	147.1453	149.6711	167.6388	176.7732	195.6061	(64)

Total per year (kWh/year) = Sum(64)m = 2002.4619 (64)
12Total per year (kWh/year) 2002 (64)
Electric shower(s)

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

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

69.5094	61.4600	65.2237	56.9425	54.6118	48.5598	47.5641	49.9286	50.9603	57.5499	61.4964	68.7186	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8520	87.3004	78.8520	81.4804	78.8520	81.4804	78.8520	78.8520	81.4804	78.8520	81.4804	78.8520	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	93.4266	91.4583	87.6663	79.0868	73.4029	67.4441	63.9302	67.1083	70.7782	77.3521	85.4117	92.3638	(72)
Total internal gains	372.6266	380.6503	364.5203	350.2890	331.5245	315.3704	302.6653	304.2999	314.4877	329.7133	350.8536	365.0010	(73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.2100	36.7938	0.6300	0.7000	0.7700	13.6061	(77)
Southwest	1.7300	36.7938	0.6300	0.7000	0.7700	19.4533	(79)

Northwest			4.8600		11.2829		0.6300		0.7000		0.7700		16.7583 (81)
Solar gains	49.8177	90.4243	138.5080	196.4008	242.6057	250.8013	237.6585	201.6664	158.3165	103.9247	60.6838	41.9776 (83)	
Total gains	422.4442	471.0746	503.0283	546.6897	574.1302	566.1717	540.3238	505.9663	472.8042	433.6380	411.5374	406.9786 (84)	

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.6932	49.8070	49.9191	50.4523	50.5533	51.0290	51.0290	51.1181	50.8447	50.5533	50.3493	50.1378	
alpha	4.3129	4.3205	4.3279	4.3635	4.3702	4.4019	4.4019	4.4079	4.3896	4.3702	4.3566	4.3425	
util living area	0.9923	0.9868	0.9757	0.9410	0.8585	0.7010	0.5404	0.5927	0.8178	0.9541	0.9861	0.9935	(86)
MIT	19.4563	19.6394	19.9251	20.3324	20.6878	20.9109	20.9778	20.9670	20.8164	20.3710	19.8528	19.4297	(87)
Th 2	19.7653	19.7677	19.7701	19.7814	19.7836	19.7935	19.7935	19.7953	19.7896	19.7836	19.7793	19.7748	(88)
util rest of house	0.9898	0.9824	0.9671	0.9188	0.8047	0.5979	0.4022	0.4528	0.7325	0.9323	0.9806	0.9913	(89)
MIT 2	18.0087	18.2427	18.6049	19.1148	19.5232	19.7437	19.7869	19.7843	19.6674	19.1726	18.5237	17.9814	(90)
Living area fraction										fLA = Living area / (4) =		0.5045	(91)
MIT	18.7391	18.9474	19.2710	19.7291	20.1108	20.3326	20.3877	20.3810	20.2471	19.7772	19.1943	18.7122	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7391	18.9474	19.2710	19.7291	20.1108	20.3326	20.3877	20.3810	20.2471	19.7772	19.1943	18.7122	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9785	0.9626	0.9177	0.8209	0.6467	0.4722	0.5235	0.7683	0.9321	0.9771	0.9887	(94)
Useful gains	416.8784	460.9253	484.1963	501.7004	471.3178	366.1454	255.1577	264.8820	363.2445	404.1982	402.0990	402.3639	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1020.6091	990.6533	898.6169	753.9282	584.3936	394.5957	260.7234	273.5474	424.6599	637.6456	843.7291	1016.6766	(97)
Space heating kWh	449.1756	355.9772	308.3289	181.6039	84.1284	0.0000	0.0000	0.0000	0.0000	173.6848	317.9737	457.0487	(98a)
Space heating requirement - total per year (kWh/year)												2327.9213	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	449.1756	355.9772	308.3289	181.6039	84.1284	0.0000	0.0000	0.0000	0.0000	173.6848	317.9737	457.0487	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2327.9213	
Space heating per m2											(98c) / (4) =	46.0245	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	449.1756	355.9772	308.3289	181.6039	84.1284	0.0000	0.0000	0.0000	0.0000	173.6848	317.9737	457.0487	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	486.1208	385.2567	333.6893	196.5411	91.0481	0.0000	0.0000	0.0000	0.0000	187.9706	344.1273	494.6414	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	197.5368	174.8971	186.4329	164.7750	158.9897	142.4366	140.5591	147.1453	149.6711	167.6388	176.7732	195.6061	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.0839	85.8702	85.4515	84.5903	83.0812	80.3000	80.3000	80.3000	80.3000	84.4575	85.6235	86.1352	(217)
Fuel for water heating, kWh/month	229.4700	203.6762	218.1740	194.7918	191.3668	177.3806	175.0425	183.2444	186.3899	198.4890	206.4541	227.0919	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.3839	13.1438	11.8345	8.6705	6.6973	5.4718	6.1095	7.9414	10.3151	13.5339	15.2865	16.8392	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.4212	-25.4665	-37.9498	-44.3059	-49.2256	-46.5090	-45.9744	-42.7044	-37.1490	-29.8789	-19.4841	-14.9603	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.2652	-15.5209	-31.2839	-47.6153	-63.5567	-64.0476	-63.2597	-53.2590	-38.6634	-22.3648	-9.7571	-5.7249	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2519.3954 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2391.5711 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	132.2273	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-833.3478	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4295.8461	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2519.3954	0.2100	529.0730	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2391.5711	0.2100	502.2299	(264)
Space and water heating			1031.3030	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2273	0.1443	19.0845	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-411.0292	0.1338	-54.9976	
PV Unit electricity exported	-422.3186	0.1255	-53.0097	
Total			-108.0073	(269)
Total CO2, kg/year			954.3094	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.8700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2519.3954	1.1300	2846.9168	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2391.5711	1.1300	2702.4754	(278)
Space and water heating			5549.3922	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2273	1.5338	202.8147	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-411.0292	1.4945	-614.2728	
PV Unit electricity exported	-422.3186	0.4607	-194.5750	
Total			-808.8479	(283)
Total Primary energy kWh/year			5073.4598	(286)
Target Primary Energy Rate (TPER)			100.3100	(287)

Full SAP Calculation Printout

Property Reference	FLAT 2	**Issued on Date**	17/06/2025
Assessment Reference	Flat 2	**Prop Type Ref**	
Property			

SAP Rating	79 C	**DER**	14.88	**TER**	17.28
Environmental	90 B	**% DER < TER**			13.89
CO_2 Emissions (t/year)	0.71	**DFEE**	42.22	**TFEE**	46.50
Compliance Check	See BREL	**% DFEE < TFEE**			9.22
% DPER < TPER	-0.93	**DPER**	92.61	**TPER**	91.76

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.7200	(1b)	x 2.7000	(2b) =	145.0440	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	145.0440	(5)

---

2. Ventilation rate

---

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.2000	(23c)
Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			12.3200	0.8687	10.7027			(27)
DOOR TO CORRIDOR			2.0000	0.9000	1.8000			(26)
OPAQUE			3.9600	0.9000	3.5640			(26)
GROUND FLOOR			53.7200	0.0900	4.8348			(28a)
External Wall	42.8500	16.2800	26.5700	0.1200	3.1884			(29a)
Exposed - Int. Wall to corrido	27.5000	2.0000	25.5000	0.1200	3.0600			(29a)
basement Wall	4.1400		4.1400	0.1200	0.4968			(29a)
Total net area of external elements Aum(A, m2)			128.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6467			(33)
Main dwelling								
Party Wall 1			9.8300	0.0000	0.0000			(32)
Party Ceiling 1			53.7200					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	14.7300	0.0700	1.0311
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1700	0.0000	0.0000
E16 Corner (normal)	9.7000	0.0900	0.8730
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	3.8000	0.0800	0.3040
P1 Party wall - Ground floor	5.1700	0.2200	1.1374
E5 Ground floor (normal)	26.0000	0.1300	3.3800
E2 Other lintels (including other steel lintels)	8.4000	0.2000	1.6800
E3 Sill	5.6000	0.0400	0.2240
E4 Jamb	34.8000	0.0500	1.7400
E22 Basement floor	5.1700	0.0700	0.3619
P6 Party wall - Ground floor (inverted)	5.1700	0.0700	0.3619

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.8503 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.4970 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.7162	13.5636	13.4110	12.6482	12.4956	11.7328	11.7328	11.5802	12.0379	12.4956	12.8008	13.1059	(38)
Heat transfer coeff	52.2132	52.0606	51.9080	51.1452	50.9926	50.2298	50.2298	50.0772	50.5349	50.9926	51.2978	51.6029	(39)

Average = Sum(39)m / 12 = 51.1071

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9691	0.9663	0.9521	0.9492	0.9350	0.9350	0.9322	0.9407	0.9492	0.9549	0.9606	(40)
HLP (average)												0.9514	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7998 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	54.3957	53.5782	52.3870	50.1079	48.4259	46.5502	45.4841	46.6663	47.9622	49.9761	52.3042	54.1873	(42a)
Hot water usage for baths	23.5152	23.1659	22.6741	21.7673	21.0884	20.3355	19.9288	20.4172	20.9489	21.7545	22.6800	23.4357	(42b)
Hot water usage for other uses	33.0614	31.8592	30.6569	29.4547	28.2525	27.0502	27.0502	28.2525	29.4547	30.6569	31.8592	33.0614	(42c)

Average daily hot water use (litres/day) 102.0091 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.9722	108.6033	105.7181	101.3299	97.7668	93.9359	92.4631	95.3359	98.3657	102.3875	106.8433	110.6843	(44)
Energy conte	175.7529	154.6497	162.4848	138.7156	131.6128	115.5052	111.8261	118.0457	121.2948	138.9389	152.2179	173.3049	(45)

Energy content (annual) Total = Sum(45)m = 1694.3494

Distribution loss (46)m = 0.15 x (45)m	26.3629	23.1975	24.3727	20.8073	19.7419	17.3258	16.7739	17.7069	18.1942	20.8408	22.8327	25.9957	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	226.7118	200.6771	213.4437	188.0307	182.5718	164.8203	162.7850	169.0047	170.6099	189.8978	201.5330	224.2638	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.7118	200.6771	213.4437	188.0307	182.5718	164.8203	162.7850	169.0047	170.6099	189.8978	201.5330	224.2638	(64)

Total per year (kWh/year) = Sum(64)m = 2294.3494 (64)

12Total per year (kWh/year) 2294 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

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

Heat gains from water heating, kWh/month	71.1776	62.9279	66.7659	58.4517	56.5010	50.7342	49.9219	51.9899	52.6593	58.9369	62.9412	70.3636	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.1285	87.6065	79.1285	81.7661	79.1285	81.7661	79.1285	79.1285	81.7661	79.1285	81.7661	79.1285	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8811	158.5090	154.4066	145.6732	134.6489	124.2876	117.3656	115.7376	119.8400	128.5734	139.5977	149.9590	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	(71)
Water heating gains (Table 5)	95.6688	93.6427	89.7391	81.1829	75.9422	70.4642	67.0993	69.8789	73.1379	79.2163	87.4184	94.5747	(72)
Total internal gains	384.6748	392.7547	376.2707	361.6188	342.7161	326.5144	313.5899	314.7415	324.7404	339.9146	361.7787	376.6588	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(79)
Northwest	3.0800	11.2829	0.3000	0.8000	0.7700	5.7799	(81)

Solar gains	62.3245	108.0815	152.9813	198.0987	229.6887	231.4594	221.7235	197.6312	168.5234	120.8281	75.0000	53.1106	(83)
Total gains	446.9993	500.8362	529.2520	559.7174	572.4048	557.9738	535.3133	512.3728	493.2638	460.7427	436.7787	429.7693	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.4485	71.6579	71.8685	72.9405	73.1587	74.2698	74.2698	74.4961	73.8213	73.1587	72.7235	72.2935	
alpha	5.7632	5.7772	5.7912	5.8627	5.8772	5.9513	5.9513	5.9664	5.9214	5.8772	5.8482	5.8196	
util living area	0.9895	0.9788	0.9575	0.8935	0.7637	0.5668	0.4116	0.4475	0.6777	0.9074	0.9772	0.9914	(86)
MIT	20.1139	20.2820	20.4923	20.7542	20.9232	20.9891	20.9986	20.9978	20.9701	20.7675	20.4078	20.0889	(87)
Th 2	20.1068	20.1092	20.1115	20.1235	20.1259	20.1378	20.1378	20.1402	20.1330	20.1259	20.1211	20.1163	(88)
util rest of house	0.9864	0.9727	0.9452	0.8648	0.7103	0.4945	0.3316	0.3650	0.6039	0.8762	0.9695	0.9889	(89)
MIT 2	19.0895	19.3026	19.5650	19.8845	20.0646	20.1319	20.1374	20.1394	20.1144	19.9078	19.4719	19.0652	(90)
Living area fraction										fLA = Living area / (4) =		0.5465	(91)
MIT	19.6494	19.8379	20.0718	20.3598	20.5338	20.6004	20.6081	20.6085	20.5821	20.3777	19.9834	19.6247	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4994	19.6879	19.9218	20.2098	20.3838	20.4504	20.4581	20.4585	20.4321	20.2277	19.8334	19.4747	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9837	0.9692	0.9421	0.8680	0.7269	0.5211	0.3615	0.3957	0.6302	0.8803	0.9664	0.9865	(94)
Useful gains	439.7079	485.3978	498.6280	485.8121	416.0580	290.7660	193.4975	202.7471	310.8671	405.5785	422.0943	423.9473	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	793.6083	769.8653	696.7002	578.4435	442.8118	293.8644	193.7901	203.2406	319.9913	490.9392	653.1954	788.2173	(97)
Space heating kWh	263.3019	191.1621	147.3657	66.6946	19.9048	0.0000	0.0000	0.0000	0.0000	63.5084	166.3928	271.0169	(98a)
Space heating requirement - total per year (kWh/year)												1189.3473	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	263.3019	191.1621	147.3657	66.6946	19.9048	0.0000	0.0000	0.0000	0.0000	63.5084	166.3928	271.0169	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1189.3473	
Space heating per m2											(98c) / (4) =	22.1397	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	263.3019	191.1621	147.3657	66.6946	19.9048	0.0000	0.0000	0.0000	0.0000	63.5084	166.3928	271.0169	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	294.1920	213.5890	164.6544	74.5191	22.2400	0.0000	0.0000	0.0000	0.0000	70.9591	185.9137	302.8122	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	226.7118	200.6771	213.4437	188.0307	182.5718	164.8203	162.7850	169.0047	170.6099	189.8978	201.5330	224.2638	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	196.3720	172.7929	181.5472	154.9895	147.0535	129.0561	124.9454	131.8947	135.5249	155.2390	170.0759	193.6368	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.4885	57.3445	63.4885	61.4405	63.4885	61.4405	63.4885	63.4885	61.4405	63.4885	61.4405	63.4885	(231)
Lighting	16.4413	13.1898	11.8760	8.7009	6.7208	5.4909	6.1309	7.9692	10.3512	13.5814	15.3401	16.8983	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1328.8796 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 1893.1278 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)

mechanical ventilation fans (SFP = 0.6020) 106.5261 (230a)

central heating pump 41.0000 (230c)

maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)

Total electricity for the above, kWh/year	747.5261	(231)
Electricity for lighting (calculated in Appendix L)	132.6910	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4102.2246	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1328.8796	0.2100	279.0647	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1893.1278	0.2100	397.5568	(264)
Space and water heating			676.6216	(265)
Pumps, fans and electric keep-hot	747.5261	0.1387	103.6911	(267)
Energy for lighting	132.6910	0.1443	19.1514	(268)
Total CO2, kg/year			799.4641	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.8800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1328.8796	1.1300	1501.6340	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1893.1278	1.1300	2139.2345	(278)
Space and water heating			3640.8685	(279)
Pumps, fans and electric keep-hot	747.5261	1.5128	1130.8575	(281)
Energy for lighting	132.6910	1.5338	203.5259	(282)
Total Primary energy kWh/year			4975.2518	(286)
Dwelling Primary energy Rate (DPER)			92.6100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.7200	(1b) x	2.7000	(2b) =	145.0440	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		145.0440	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1379	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3879	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3297	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4204	0.4121	0.4039	0.3627	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874	(22b)
Effective ac	0.5884	0.5849	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5750	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			5.9600	1.0000	5.9600			(26)
TER Opening Type			7.4700	1.1450	8.5534			(27)
GROUND FLOOR			53.7200	0.1300	6.9836			(28a)
External Wall	42.8500	11.4300	31.4200	0.1800	5.6556			(29a)
Exposed - Int. Wall to corrido	27.5000	2.0000	25.5000	0.1800	4.5900			(29a)
basement Wall	4.1400		4.1400	0.1800	0.7452			(29a)
Total net area of external elements Aum(A, m2)			128.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4878			(33)
Main dwelling								
Party Wall 1			9.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	14.7300	0.0700	1.0311
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1700	0.0000	0.0000
E16 Corner (normal)	9.7000	0.0900	0.8730
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	3.8000	0.0600	0.2280
P1 Party wall - Ground floor	5.1700	0.0800	0.4136
E5 Ground floor (normal)	26.0000	0.1600	4.1600
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	34.8000	0.0500	1.7400
E22 Basement floor	5.1700	0.0700	0.3619
P6 Party wall - Ground floor (inverted)	5.1700	0.0700	0.3619

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.6265 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.1143 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.1615	27.9972	27.8363	27.0802	26.9387	26.2802	26.2802	26.1582	26.5338	26.9387	27.2249	27.5241	(38)
Heat transfer coeff	70.2758	70.1116	69.9506	69.1945	69.0530	68.3945	68.3945	68.2726	68.6482	69.0530	69.3392	69.6384	(39)
Average = Sum(39)m / 12 =												69.1938	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3082	1.3051	1.3021	1.2881	1.2854	1.2732	1.2732	1.2709	1.2779	1.2854	1.2908	1.2963	(40)
HLP (average)												1.2880	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7998 (42)

Hot water usage for mixer showers												
54.3957	53.5782	52.3870	50.1079	48.4259	46.5502	45.4841	46.6663	47.9622	49.9761	52.3042	54.1873	(42a)
Hot water usage for baths												
23.5152	23.1659	22.6741	21.7673	21.0884	20.3355	19.9288	20.4172	20.9489	21.7545	22.6800	23.4357	(42b)
Hot water usage for other uses												
33.0614	31.8592	30.6569	29.4547	28.2525	27.0502	27.0502	28.2525	29.4547	30.6569	31.8592	33.0614	(42c)
Average daily hot water use (litres/day)												102.0091	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	110.9722	108.6033	105.7181	101.3299	97.7668	93.9359	92.4631	95.3359	98.3657	102.3875	106.8433	110.6843	(44)
Energy conte	175.7529	154.6497	162.4848	138.7156	131.6128	115.5052	111.8261	118.0457	121.2948	138.9389	152.2179	173.3049	(45)
Energy content (annual)										Total = Sum(45)m =		1694.3494	
Distribution loss (46)m = 0.15 x (45)m													
	26.3629	23.1975	24.3727	20.8073	19.7419	17.3258	16.7739	17.7069	18.1942	20.8408	22.8327	25.9957	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.8209	46.3246	47.1182	48.5821	48.5091	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	226.7118	200.6771	213.4437	188.0307	181.4337	161.8298	158.9443	166.6279	169.8039	189.8978	201.5330	224.2638	(62)
WWHRS	-24.8674	-21.9930	-23.0298	-19.0696	-17.7721	-15.2077	-14.2548	-15.1586	-15.7345	-18.5493	-21.0141	-24.4069	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	201.8444	178.6841	190.4139	168.9611	163.6616	146.6220	144.6895	151.4693	154.0694	171.3485	180.5189	199.8569	(64)
										Total per year (kWh/year) = Sum(64)m =		2052.1396	(64)
12Total per year (kWh/year)												2052	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	71.1776	62.9279	66.7659	58.4517	56.2165	49.9866	48.9617	51.3957	52.4578	58.9369	62.9412	70.3636	(65)

---

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.0157	94.1245	85.0157	87.8496	85.0157	87.8496	85.0157	85.0157	87.8496	85.0157	87.8496	85.0157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.8811	158.5090	154.4066	145.6732	134.6489	124.2876	117.3656	115.7376	119.8400	128.5734	139.5977	149.9590	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	(71)
Water heating gains (Table 5)													
	95.6688	93.6427	89.7391	81.1829	75.5598	69.4259	65.8088	69.0803	72.8581	79.2163	87.4184	94.5747	(72)
Total internal gains													
	390.5620	399.2727	382.1580	367.7022	348.2209	331.5595	318.1865	319.8301	330.5441	345.8018	367.8621	382.5460	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.6000	36.7938	0.6300	0.7000	0.7700	62.9702	(79)
Northwest	1.8700	11.2829	0.6300	0.7000	0.7700	6.4482	(81)

Solar gains	69.4183	120.3869	170.4077	220.6791	255.8827	257.8608	247.0121	220.1633	187.7251	134.5871	83.5372	59.1552	(83)
Total gains	459.9804	519.6596	552.5657	588.3813	604.1036	589.4203	565.1987	539.9934	518.2692	480.3889	451.3993	441.7012	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.0845	53.2089	53.3313	53.9140	54.0245	54.5447	54.5447	54.6421	54.3431	54.0245	53.8015	53.5704	
alpha	4.5390	4.5473	4.5554	4.5943	4.6016	4.6363	4.6363	4.6428	4.6229	4.6016	4.5868	4.5714	
util living area	0.9913	0.9839	0.9704	0.9317	0.8456	0.6835	0.5186	0.5610	0.7833	0.9418	0.9834	0.9927	(86)
MIT	19.6081	19.8017	20.0717	20.4374	20.7442	20.9319	20.9848	20.9783	20.8679	20.4826	19.9884	19.5783	(87)
Th 2	19.8344	19.8368	19.8392	19.8502	19.8523	19.8619	19.8619	19.8637	19.8582	19.8523	19.8481	19.8437	(88)
util rest of house	0.9885	0.9787	0.9603	0.9076	0.7913	0.5848	0.3915	0.4325	0.6965	0.9162	0.9770	0.9903	(89)
MIT 2	18.2490	18.4955	18.8365	19.2916	19.6401	19.8239	19.8573	19.8564	19.7724	19.3556	18.7423	18.2176	(90)
Living area fraction									fLA = Living area / (4) =			0.5465	(91)
MIT	18.9918	19.2094	19.5116	19.9178	20.2436	20.4295	20.4735	20.4696	20.3712	19.9715	19.4234	18.9613	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9918	19.2094	19.5116	19.9178	20.2436	20.4295	20.4735	20.4696	20.3712	19.9715	19.4234	18.9613	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9857	0.9751	0.9569	0.9093	0.8116	0.6363	0.4612	0.5028	0.7385	0.9194	0.9740	0.9879	(94)
Useful gains	453.4072	506.7438	528.7225	535.0082	490.2980	375.0291	260.6738	271.5233	382.7647	441.6749	439.6636	436.3531	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1032.4761	1003.2533	910.1682	762.3704	589.9583	398.7054	264.9285	277.8388	430.5030	647.1332	854.4931	1027.9536	(97)
Space heating kWh	430.8273	333.6544	283.7956	163.7008	74.1473	0.0000	0.0000	0.0000	0.0000	152.8610	298.6772	440.1508	(98a)
Space heating requirement - total per year (kWh/year)												2177.8144	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	430.8273	333.6544	283.7956	163.7008	74.1473	0.0000	0.0000	0.0000	0.0000	152.8610	298.6772	440.1508	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2177.8144	
Space heating per m2											(98c) / (4) =	40.5401	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	430.8273	333.6544	283.7956	163.7008	74.1473	0.0000	0.0000	0.0000	0.0000	152.8610	298.6772	440.1508	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	466.2633	361.0979	307.1381	177.1654	80.2460	0.0000	0.0000	0.0000	0.0000	165.4339	323.2437	476.3536	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	201.8444	178.6841	190.4139	168.9611	163.6616	146.6220	144.6895	151.4693	154.0694	171.3485	180.5189	199.8569	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9628	85.6990	85.2346	84.3137	82.7974	80.3000	80.3000	80.3000	80.3000	84.1376	85.4524	86.0231	(217)
Fuel for water heating, kWh/month	234.8043	208.5020	223.3999	200.3959	197.6652	182.5928	180.1862	188.6292	191.8673	203.6528	211.2508	232.3295	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	17.6646	14.1712	12.7596	9.3482	7.2208	5.8995	6.5871	8.5621	11.1214	14.5918	16.4815	18.1555	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.4697	-26.9803	-40.1740	-46.8595	-52.0189	-49.1258	-48.5574	-45.1251	-39.2874	-31.6344	-20.6491	-15.8625	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.7492	-16.5516	-33.3578	-50.7682	-67.7650	-68.2941	-67.4578	-56.7958	-41.2314	-23.8525	-10.4075	-6.1069	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

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

Annual totals kWh/year		
Space heating fuel - main system 1	2356.9420	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2455.2759	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.5633	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-885.0819	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4155.6993	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2356.9420	0.2100	494.9578	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2759	0.2100	515.6079	(264)
Space and water heating			1010.5657	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.5633	0.1443	20.5763	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-434.7441	0.1338	-58.1794	
PV Unit electricity exported	-450.3378	0.1255	-56.5268	
Total			-114.7062	(269)
Total CO2, kg/year			928.3651	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.2800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2356.9420	1.1300	2663.3444	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2759	1.1300	2774.4617	(278)
Space and water heating			5437.8061	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.5633	1.5338	218.6684	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-434.7441	1.4945	-649.7463	
PV Unit electricity exported	-450.3378	0.4607	-207.4847	
Total			-857.2310	(283)
Total Primary energy kWh/year			4929.3443	(286)
Target Primary Energy Rate (TPER)			91.7600	(287)

Energy Assessment
Wellington Road

+44 (0)20 7043 0418
info@eightversa.com

Be Lean – Block compliance report

Block Compliance

Block Reference	11260 Wellington Rd RKS lean	**Issued on Date**	02/06/2025
Block Name	11260 Wellington Rd		
Calculation Type	New Build (As Designed)		
Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

Block Compliance Report - DER

Block Reference: 11260 Wellington Rd RKS lean	Block Name: 11260 Wellington Rd			
Property-Assessment Reference	**Floor area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
FLAT 1 - Flat 1	50.58	15.88	18.87	15.85 %
FLAT 10 - FLAT 10	52.43	11.52	12.99	11.32 %
FLAT 11 - Flat 11	52.43	11.53	12.99	11.24 %
FLAT 12 - Flat 12	60.03	12.13	13.41	9.55 %
FLAT 13 - Flat 13	53.85	14.76	16.52	10.65 %
FLAT 14 - Flat 14	51.16	17.64	18.84	6.37 %
FLAT 15 - Flat 15	50.58	15.72	16.56	5.07 %
FLAT 16 - Flat 16	77.60	12.38	13.49	8.23 %
FLAT 17 - FLAT 17	52.40	14.39	14.85	3.10 %
FLAT 18 - FLAT 18	52.43	14.43	14.70	1.84 %
FLAT 19 - FLAT 19	52.43	14.43	14.70	1.84 %
FLAT 2 - Flat 2	53.72	14.88	17.28	13.89 %
FLAT 20 - Flat 20	60.00	13.81	14.56	5.15 %
FLAT 21 - Flat 21	67.26	14.93	15.69	4.84 %
FLAT 3 - Flat 3	52.40	13.31	15.40	13.57 %
FLAT 4 - Flat 4	52.40	13.36	15.18	11.99 %
FLAT 5 - FLAT 5	52.40	13.36	15.18	11.99 %
FLAT 6 - Flat 6	60.03	12.84	14.40	10.83 %
FLAT 7 - Flat 7	50.58	13.42	15.47	13.25 %
flat 8 - Flat 8	77.69	11.90	9.04	-31.64 %
FLAT 9 - Flat 9	52.40	11.53	13.04	11.58 %
Studio - Studio	22.69	24.56	31.48	21.98 %

Block Compliance

Totals:	1207.49	312.71	344.64	
Average DER = 13.85 kgCO₂/m²	**% DER/TER**	PASS		
Average TER = 15.06 kgCO₂/m²	8.01 %			

Block Compliance Report - DFEE

Block Reference: 11260 Wellington Rd RKS lean	**Block Name: 11260 Wellington Rd**			
Property-Assessment Reference	**Floor area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
FLAT 1 - Flat 1	50.58	45.45	52.39	13.25 %
FLAT 10 - FLAT 10	52.43	25.72	26.69	3.66 %
FLAT 11 - Flat 11	52.43	25.80	26.71	3.41 %
FLAT 12 - Flat 12	60.03	31.67	31.55	-0.37 %
FLAT 13 - Flat 13	53.85	41.90	43.38	3.40 %
FLAT 14 - Flat 14	51.16	53.17	52.66	-0.96 %
FLAT 15 - Flat 15	50.58	44.76	42.06	-6.41 %
FLAT 16 - Flat 16	77.60	38.44	38.43	-0.02 %
FLAT 17 - FLAT 17	52.40	39.64	35.12	-12.87 %
FLAT 18 - FLAT 18	52.43	39.83	34.48	-15.51 %
FLAT 19 - FLAT 19	52.43	39.83	34.48	-15.51 %
FLAT 2 - Flat 2	53.72	42.22	46.50	9.22 %
FLAT 20 - Flat 20	60.00	39.40	37.05	-6.35 %
FLAT 21 - Flat 21	67.26	46.56	45.13	-3.17 %
FLAT 3 - Flat 3	52.40	34.71	37.66	7.84 %
FLAT 4 - Flat 4	52.40	34.91	36.67	4.80 %
FLAT 5 - FLAT 5	52.40	34.91	36.67	4.81 %
FLAT 6 - Flat 6	60.03	35.33	36.07	2.05 %
FLAT 7 - Flat 7	50.58	34.66	37.04	6.44 %
flat 8 - Flat 8	77.69	36.31	37.57	3.35 %

Block Compliance

FLAT 9 - Flat 9	52.40	25.80	26.91	4.13 %
Studio - Studio	22.69	61.75	75.92	18.66 %
Totals:	1207.49	852.76	871.17	
Average DFEE = 38.15 kWh/m²/yr	**% DFEE/TFEE**	PASS		
Average TFEE = 38.60 kWh/m²/yr	1.15 %			

Block Compliance Report - DPER

Block Reference: 11260 Wellington Rd RKS lean	**Block Name: 11260 Wellington Rd**			
Property-Assessment Reference	**Floor area (m^2)**	**DPER ($kWh/m^2/yr$)**	**TPER ($kWh/m^2/yr$)**	**% DPER/TPER**
FLAT 1 - Flat 1	50.58	98.57	100.31	1.73 %
FLAT 10 - FLAT 10	52.43	74.81	68.64	-8.99 %
FLAT 11 - Flat 11	52.43	74.90	68.66	-9.09 %
FLAT 12 - Flat 12	60.03	76.85	70.87	-8.44 %
FLAT 13 - Flat 13	53.85	91.93	87.61	-4.93 %
FLAT 14 - Flat 14	51.16	107.95	100.15	-7.79 %
FLAT 15 - Flat 15	50.58	97.71	87.84	-11.24 %
FLAT 16 - Flat 16	77.60	76.25	71.11	-7.23 %
FLAT 17 - FLAT 17	52.40	90.29	78.62	-14.84 %
FLAT 18 - FLAT 18	52.43	90.50	77.85	-16.25 %
FLAT 19 - FLAT 19	52.43	90.50	77.85	-16.25 %
FLAT 2 - Flat 2	53.72	92.61	91.76	-0.93 %
FLAT 20 - Flat 20	60.00	85.89	77.01	-11.53 %
FLAT 21 - Flat 21	67.26	90.99	82.97	-9.67 %
FLAT 3 - Flat 3	52.40	84.45	81.62	-3.47 %
FLAT 4 - Flat 4	52.40	84.72	80.42	-5.35 %
FLAT 5 - FLAT 5	52.40	84.72	80.43	-5.33 %
FLAT 6 - Flat 6	60.03	80.63	76.23	-5.77 %
FLAT 7 - Flat 7	50.58	85.36	82.04	-4.05 %
flat 8 - Flat 8	77.69	73.64	48.50	-51.84 %

Block Compliance

FLAT 9 - Flat 9	52.40	74.91	68.91	-8.71 %
Studio - Studio	22.69	157.99	169.42	6.75 %
Totals:	1207.49	1966.17	1828.82	
Average DPER = 86.91 kWh/m²/yr	**% DPER/TPER**	FAIL		
Average TPER = 79.83 kWh/m²/yr	-8.87 %			

Energy Assessment
Wellington Road

+44 (0)20 7043 0418
info@eightversa.com

Baseline – TER from the Be Green TER SAP worksheet
Be Green – DER from the Be Green scenario DER SAP worksheet

Full SAP Calculation Printout

Property Reference	FLAT 10	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 10	**Prop Type Ref**	
Property			

SAP Rating	93 A	**DER**	2.19	**TER**	12.44
Environmental	99 A	**% DER < TER**			82.40
CO_2 Emissions (t/year)	0.11	**DFEE**	25.72	**TFEE**	26.69
Compliance Check	See BREL	**% DFEE < TFEE**			3.66
% DPER < TPER	66.08	**DPER**	22.28	**TPER**	65.69

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.5610	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.0000	11.0000	18.0000	0.1200	2.1600			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1200	2.1984			(29a)
Total net area of external elements Aum(A, m2)			49.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9769			(33)
Main dwelling								
Party Wall 1			36.6100	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.8000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	21.8000	0.0700	1.5260	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.0000	0.0800	1.2000	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3970 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 22.3739 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7167	12.5810	12.4452	11.7664	11.6306	10.9518	10.9518	10.8160	11.2233	11.6306	11.9021	12.1737	(38)
Heat transfer coeff	35.0907	34.9549	34.8192	34.1403	34.0046	33.3257	33.3257	33.1900	33.5973	34.0046	34.2761	34.5476	(39)
Average = Sum(39)m / 12 =												34.1064	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6693	0.6667	0.6641	0.6512	0.6486	0.6356	0.6356	0.6330	0.6408	0.6486	0.6537	0.6589	(40)
HLP (average)												0.6505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)
Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)											Total = Sum(45)m =	1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.6302	(55)
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(64)
										Total per year (kWh/year) = Sum(64)m =		2791.0754	(64)
12Total per year (kWh/year)												2791	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	101.6390	90.4574	97.2791	88.0528	87.1345	55.9650	55.3563	57.4001	57.8674	89.5418	92.4896	100.8346	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8505	89.5130	80.8505	83.5455	80.8505	83.5455	80.8505	80.8505	83.5455	80.8505	83.5455	80.8505	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	136.6115	134.6092	130.7514	122.2955	117.1162	77.7291	74.4037	77.1507	80.3714	120.3519	128.4578	135.5303	(72)
Total internal gains	420.4293	428.6827	412.1474	397.8391	379.1751	332.3423	319.5472	320.7009	330.6317	376.4646	398.0552	412.5734	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)

Total gains	471.5887	515.8262	531.3809	545.5751	544.6518	496.6224	477.9307	465.8491	459.7363	472.7767	459.3324	456.3552	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	103.7589	104.1619	104.5681	106.6473	107.0731	109.2541	109.2541	109.7010	108.3711	107.0731	106.2248	105.3900	
alpha	7.9173	7.9441	7.9712	8.1098	8.1382	8.2836	8.2836	8.3134	8.2247	8.1382	8.0817	8.0260	
util living area													
	0.9591	0.9228	0.8645	0.7363	0.5777	0.4292	0.3068	0.3277	0.5034	0.7289	0.9054	0.9650	(86)
Living	20.7004	20.8055	20.8979	20.9743	20.9964	20.9997	21.0000	21.0000	20.9991	20.9797	20.8639	20.6856	
Non living	20.0351	20.1621	20.2698	20.3612	20.3838	20.3979	20.3980	20.4004	20.3929	20.3695	20.2424	20.0253	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.8467	20.8055	20.8979	20.9743	20.9964	20.9997	21.0000	21.0000	20.9991	20.9797	20.8639	20.7296	(87)
Th 2	20.3680	20.3703	20.3726	20.3842	20.3865	20.3980	20.3980	20.4004	20.3934	20.3865	20.3819	20.3773	(88)
util rest of house													
	0.9501	0.9080	0.8418	0.7041	0.5406	0.3890	0.2648	0.2850	0.4595	0.6914	0.8859	0.9570	(89)
MIT 2	20.2353	20.1621	20.2698	20.3612	20.3838	20.3979	20.3980	20.4004	20.3929	20.3695	20.2424	20.0888	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	20.5257	20.4676	20.5681	20.6524	20.6747	20.6837	20.6839	20.6851	20.6808	20.6593	20.5376	20.3931	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5257	20.4676	20.5681	20.6524	20.6747	20.6837	20.6839	20.6851	20.6808	20.6593	20.5376	20.3931	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9525	0.9104	0.8491	0.7183	0.5581	0.4081	0.2848	0.3053	0.4803	0.7084	0.8911	0.9573	(94)
Useful gains	449.1966	469.6284	451.2195	391.8792	303.9721	202.6730	136.0965	142.2180	220.8166	334.8979	409.3106	436.8513	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	569.3708	544.1659	489.8400	401.2302	305.1817	202.7449	136.0995	142.2232	221.0955	342.0610	460.5882	559.4326	(97)
Space heating kWh													
	89.4096	50.0892	28.7337	6.7327	0.8999	0.0000	0.0000	0.0000	0.0000	5.3293	36.9199	91.2005	(98a)
Space heating requirement - total per year (kWh/year)												309.3149	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	89.4096	50.0892	28.7337	6.7327	0.8999	0.0000	0.0000	0.0000	0.0000	5.3293	36.9199	91.2005	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												309.3149	
Space heating per m2											(98c) / (4) =	5.8996	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												205.0842	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	89.4096	50.0892	28.7337	6.7327	0.8999	0.0000	0.0000	0.0000	0.0000	5.3293	36.9199	91.2005	(98)
Space heating efficiency (main heating system 1)													
	205.0842	205.0842	205.0842	205.0842	205.0842	0.0000	0.0000	0.0000	0.0000	205.0842	205.0842	205.0842	(210)
Space heating fuel (main heating system)													
	43.5965	24.4237	14.0107	3.2829	0.4388	0.0000	0.0000	0.0000	0.0000	2.5986	18.0023	44.4698	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(64)
Efficiency of water heater												214.7105	(216)
(217)m	214.7105	214.7105	214.7105	214.7105	214.7105	214.7105	214.7105	214.7105	214.7105	214.7105	214.7105	214.7105	(217)
Fuel for water heating, kWh/month													
	129.9828	115.5190	123.8757	111.3517	109.6659	86.4278	85.8431	88.7058	89.0926	113.0379	117.5666	128.8560	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.8302	7.9756	8.8302	8.5453	8.8302	8.5453	8.8302	8.8302	8.5453	8.8302	8.5453	8.8302	(231)
Lighting	16.7991	13.4769	12.1344	8.8902	6.8671	5.6104	6.2644	8.1426	10.5765	13.8769	15.6740	17.2660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.2248	-62.1637	-91.0408	-102.6104	-111.3939	-101.0985	-99.9274	-94.8188	-84.0123	-70.9964	-47.5374	-37.1236	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												150.8233	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												214.7105	
Water heating fuel used												1299.9248	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9681	(230a)
Total electricity for the above, kWh/year	103.9681	(231)
Electricity for lighting (calculated in Appendix L)	135.5786	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-945.9481	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	744.3467	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	150.8233	0.1592	24.0054	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1299.9248	0.1414	183.8559	(264)
Space and water heating			207.8613	(265)
Pumps, fans and electric keep-hot	103.9681	0.1387	14.4217	(267)
Energy for lighting	135.5786	0.1443	19.5682	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-945.9481	0.1345	-127.2762	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-127.2762	(269)
Total CO2, kg/year			114.5750	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.1900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	150.8233	1.5891	239.6781	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1299.9248	1.5230	1979.8130	(278)
Space and water heating			2219.4911	(279)
Pumps, fans and electric keep-hot	103.9681	1.5128	157.2829	(281)
Energy for lighting	135.5786	1.5338	207.9550	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-945.9481	1.4973	-1416.3432	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1416.3432	(283)
Total Primary energy kWh/year			1168.3858	(286)
Dwelling Primary energy Rate (DPER)			22.2800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b) x	2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.4300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.5610	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3791	0.3715	0.3336	0.3260	0.2881	0.2881	0.2805	0.3032	0.3260	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2700	1.1450	9.4695			(27)
External Wall 1	29.0000	10.9100	18.0900	0.1800	3.2562			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.0000	18.3200	0.1800	3.2976			(29a)
Total net area of external elements Aum(A, m2)			49.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.8633			(33)
Main dwelling								
Party Wall 1			36.6100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.8000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.8000	0.0700	1.5260
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.0000	0.0200	0.3000
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.5270 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.3903 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8492	26.7136	26.5807	25.9565	25.8397	25.2960	25.2960	25.1953	25.5054	25.8397	26.0760	26.3230	(38)
Heat transfer coeff													
	52.2395	52.1039	51.9710	51.3468	51.2300	50.6863	50.6863	50.5856	50.8957	51.2300	51.4662	51.7133	(39)
Average = Sum(39)m / 12 =												51.3462	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9964	0.9938	0.9912	0.9793	0.9771	0.9667	0.9667	0.9648	0.9707	0.9771	0.9816	0.9863	(40)
HLP (average)												0.9793	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m													
	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	220.2879	194.9228	207.1753	182.1817	176.6652	159.2433	157.1104	163.2571	164.9650	183.9053	195.5256	217.8685	(62)
WWHRS	-24.5761	-21.7353	-22.7599	-18.8461	-17.5639	-15.0296	-14.0878	-14.9810	-15.5502	-18.3319	-20.7679	-24.1210	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	195.7118	173.1876	184.4154	163.3356	159.1013	144.2138	143.0226	148.2761	149.4148	165.5734	174.7578	193.7476	(64)
										Total per year (kWh/year) = Sum(64)m =		1994.7576	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.0288	84.4869	90.6689	81.6558	80.5243	74.0288	74.0223	76.0661	75.9313	82.9316	86.0927	94.2244	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.0251	89.7063	81.0251	83.7259	81.0251	83.7259	81.0251	81.0251	83.7259	81.0251	83.7259	81.0251	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
153.5409 155.1342 151.1192 142.5717 131.7821 121.6414 114.8667 113.2735 117.2885 125.8359 136.6256 146.7663 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
31.8088 31.8088 31.8088 31.8088 31.8088 31.8088 31.8088 31.8088 31.8088 31.8088 31.8088 31.8088 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-70.4702 -70.4702 -70.4702 -70.4702 -70.4702 -70.4702 -70.4702 -70.4702 -70.4702 -70.4702 -70.4702 -70.4702 (71)
Water heating gains (Table 5)
127.7269 125.7246 121.8668 113.4109 108.2316 102.8178 99.4924 102.2394 105.4601 111.4673 119.5732 126.6457 (72)
Total internal gains
414.7192 422.9914 406.4374 392.1349 373.4651 357.6114 344.8105 345.9642 355.9008 370.7546 392.3510 406.8634 (73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.1800	36.7938	0.6300	0.7000	0.7700	24.5134	(77)
Southwest	6.0900	36.7938	0.6300	0.7000	0.7700	68.4801	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	92.9935	158.4023	216.7329	268.5425	300.7900	298.6149	287.8966	263.8385	234.6759	175.0682	111.3847	79.5830	(83)
Total gains	507.7127	581.3937	623.1703	660.6774	674.2551	656.2263	632.7071	609.8028	590.5767	545.8228	503.7357	486.4464	(84)

---
7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6977	69.8791	70.0578	70.9095	71.0711	71.8335	71.8335	71.9764	71.5379	71.0711	70.7449	70.4069	
alpha	5.6465	5.6586	5.6705	5.7273	5.7381	5.7889	5.7889	5.7984	5.7692	5.7381	5.7163	5.6938	
util living area	0.9798	0.9578	0.9180	0.8240	0.6753	0.4901	0.3519	0.3807	0.5823	0.8411	0.9560	0.9835	(86)
MIT	20.2113	20.4065	20.6178	20.8377	20.9555	20.9941	20.9993	20.9989	20.9845	20.8444	20.5068	20.1773	(87)
Th 2	20.0864	20.0885	20.0906	20.1006	20.1025	20.1111	20.1111	20.1128	20.1078	20.1025	20.0987	20.0947	(88)
util rest of house	0.9741	0.9468	0.8978	0.7865	0.6199	0.4239	0.2811	0.3078	0.5121	0.7988	0.9427	0.9788	(89)
MIT 2	19.1954	19.4380	19.6940	19.9504	20.0687	20.1080	20.1109	20.1124	20.0987	19.9649	19.5732	19.1595	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	19.6779	19.8979	20.1327	20.3718	20.4899	20.5288	20.5328	20.5334	20.5194	20.3826	20.0166	19.6429	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6779	19.8979	20.1327	20.3718	20.4899	20.5288	20.5328	20.5334	20.5194	20.3826	20.0166	19.6429	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9710	0.9442	0.8989	0.7984	0.6444	0.4552	0.3148	0.3424	0.5449	0.8129	0.9413	0.9759	(94)
Useful gains	493.0129	548.9396	560.1423	527.5116	434.5119	298.7300	199.1692	208.8123	321.8344	443.7186	474.1516	474.7178	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	803.3324	781.4513	708.5067	589.0386	450.3038	300.5104	199.3396	209.0895	326.7206	501.1615	664.7699	798.6016	(97)
Space heating kWh	230.8777	156.2479	110.3831	44.2995	11.7492	0.0000	0.0000	0.0000	0.0000	42.7375	137.2452	240.9696	(98a)
Space heating requirement - total per year (kWh/year)												974.5097	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	230.8777	156.2479	110.3831	44.2995	11.7492	0.0000	0.0000	0.0000	0.0000	42.7375	137.2452	240.9696	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												974.5097	
Space heating per m2											(98c) / (4) =	18.5869	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	230.8777	156.2479	110.3831	44.2995	11.7492	0.0000	0.0000	0.0000	0.0000	42.7375	137.2452	240.9696	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	250.1383	169.2826	119.5917	47.9951	12.7294	0.0000	0.0000	0.0000	0.0000	46.3028	148.6947	261.0721	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	195.7118	173.1876	184.4154	163.3356	159.1013	144.2138	143.0226	148.2761	149.4148	165.5734	174.7578	193.7476	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4313	83.8297	82.9478	81.5637	80.3601	79.8000	79.8000	79.8000	79.8000	81.4946	83.5237	84.5501	(217)
Fuel for water heating, kWh/month	231.8000	206.5945	222.3269	200.2552	197.9855	180.7190	179.2263	185.8097	187.2366	203.1711	209.2313	229.1513	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8354	13.5060	12.1606	8.9094	6.8819	5.6226	6.2779	8.1602	10.5993	13.9069	15.7078	17.3033	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	-18.0344	-26.3504	-39.2477	-45.7962	-50.8571	-48.0381	-47.4820	-44.1143	-38.3927	-30.9010	-20.1642	-15.4880	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5549	-16.1362	-32.5183	-49.4871	-66.0504	-66.5622	-65.7474	-55.3591	-40.1926	-23.2535	-10.1465	-5.9538	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1055.8068	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2433.5074	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.8280	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2847.3575	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1055.8068	0.2100	221.7194	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2433.5074	0.2100	511.0366	(264)
Space and water heating			732.7560	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8714	0.1443	19.6104	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	0.1338	-56.8542	
PV Unit electricity exported	-438.9620	0.1255	-55.0999	
Total			-111.9542	(269)
Total CO2, kg/year			652.3415	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1055.8068	1.1300	1193.0617	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2433.5074	1.1300	2749.8634	(278)
Space and water heating			3942.9250	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8714	1.5338	208.4040	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	1.4945	-634.9711	
PV Unit electricity exported	-438.9620	0.4607	-202.2474	
Total			-837.2185	(283)
Total Primary energy kWh/year			3444.2114	(286)
Target Primary Energy Rate (TPER)			65.6900	(287)

Full SAP Calculation Printout

Property Reference	FLAT 11	**Issued on Date**	17/06/2025
Assessment Reference	Flat 11	**Prop Type Ref**	
Property			

SAP Rating	93 A	**DER**	2.18	**TER**	12.45
Environmental	99 A	**% DER < TER**			82.49
CO_2 Emissions (t/year)	0.11	**DFEE**	25.80	**TFEE**	26.71
Compliance Check	See BREL	**% DFEE < TFEE**			3.41
% DPER < TPER	66.24	**DPER**	22.18	**TPER**	65.71

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.5610	(5)

---

2. Ventilation rate

---

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.0000	11.0000	18.0000	0.1200	2.1600			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1200	2.1984			(29a)
Total net area of external elements Aum(A, m2)			49.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9769			(33)
Main dwelling								
Party Wall 1			36.6100	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.8000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	21.8000	0.0700	1.5260	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.0000	0.0800	1.2000	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E2 Other lintels (including other steel lintels)	6.4000	0.2000	1.2800	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.4770 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	22.4539 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7167	12.5810	12.4452	11.7664	11.6306	10.9518	10.9518	10.8160	11.2233	11.6306	11.9021	12.1737	(38)
Heat transfer coeff	35.1707	35.0349	34.8992	34.2203	34.0846	33.4057	33.4057	33.2700	33.6773	34.0846	34.3561	34.6276	(39)
Average = Sum(39)m / 12 =												34.1864	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6708	0.6682	0.6656	0.6527	0.6501	0.6371	0.6371	0.6346	0.6423	0.6501	0.6553	0.6605	(40)
HLP (average)												0.6520	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)											Total = Sum(45)m =	1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)

Water storage loss:

Store volume	150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	2.0900 (48)
Temperature factor from Table 2b	0.7800 (49)
Enter (49) or (54) in (55)	1.6302 (55)

Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss 54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(64)
										Total per year (kWh/year) = Sum(64)m =	2791.0754	(64)
12Total per year (kWh/year)											2791	(64)

Electric shower(s)

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

Heat gains from water heating, kWh/month

101.6390	90.4574	97.2791	88.0528	87.1345	55.9650	55.3563	57.4001	57.8674	89.5418	92.4896	100.8346	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8505	89.5130	80.8505	83.5455	80.8505	83.5455	80.8505	80.8505	83.5455	80.8505	83.5455	80.8505	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	136.6115	134.6092	130.7514	122.2955	117.1162	77.7291	74.4037	77.1507	80.3714	120.3519	128.4578	135.5303	(72)
Total internal gains	420.4293	428.6827	412.1474	397.8391	379.1751	332.3423	319.5472	320.7009	330.6317	376.4646	398.0552	412.5734	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains 51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)

Total gains	471.5887	515.8262	531.3809	545.5751	544.6518	496.6224	477.9307	465.8491	459.7363	472.7767	459.3324	456.3552	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	103.5229	103.9241	104.3284	106.3980	106.8218	108.9925	108.9925	109.4372	108.1137	106.8218	105.9775	105.1465	
alpha	7.9015	7.9283	7.9552	8.0932	8.1215	8.2662	8.2662	8.2958	8.2076	8.1215	8.0652	8.0098	
util living area													
	0.9595	0.9234	0.8654	0.7376	0.5790	0.4303	0.3075	0.3285	0.5045	0.7303	0.9062	0.9653	(86)
Living	20.6979	20.8034	20.8965	20.9738	20.9963	20.9997	21.0000	21.0000	20.9990	20.9793	20.8622	20.6830	
Non living	20.0308	20.1583	20.2669	20.3594	20.3824	20.3965	20.3967	20.3990	20.3915	20.3677	20.2393	20.0209	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.8454	20.8034	20.8965	20.9738	20.9963	20.9997	21.0000	21.0000	20.9990	20.9793	20.8622	20.7273	(87)
Th 2	20.3667	20.3690	20.3713	20.3828	20.3851	20.3967	20.3967	20.3990	20.3921	20.3851	20.3805	20.3759	(88)
util rest of house													
	0.9505	0.9087	0.8428	0.7053	0.5418	0.3898	0.2654	0.2856	0.4605	0.6927	0.8867	0.9574	(89)
MIT 2	20.2328	20.1583	20.2669	20.3594	20.3824	20.3965	20.3967	20.3990	20.3915	20.3677	20.2393	20.0849	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	20.5237	20.4647	20.5659	20.6512	20.6739	20.6830	20.6832	20.6844	20.6800	20.6582	20.5351	20.3900	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5237	20.4647	20.5659	20.6512	20.6739	20.6830	20.6832	20.6844	20.6800	20.6582	20.5351	20.3900	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9529	0.9110	0.8501	0.7196	0.5593	0.4090	0.2854	0.3060	0.4814	0.7097	0.8918	0.9576	(94)
Useful gains	449.3621	469.9424	451.7128	392.5803	304.6290	203.1330	136.3992	142.5368	221.3093	335.5098	409.6533	436.9934	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	570.6003	545.3072	490.8888	402.1285	305.8724	203.2074	136.4023	142.5421	221.5971	342.8278	461.5783	560.6209	(97)
Space heating kWh													
	90.2012	50.6451	29.1470	6.8747	0.9251	0.0000	0.0000	0.0000	0.0000	5.4446	37.3860	91.9789	(98a)
Space heating requirement - total per year (kWh/year)												312.6026	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	90.2012	50.6451	29.1470	6.8747	0.9251	0.0000	0.0000	0.0000	0.0000	5.4446	37.3860	91.9789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												312.6026	
Space heating per m2											(98c) / (4) =	5.9623	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												205.8457	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	90.2012	50.6451	29.1470	6.8747	0.9251	0.0000	0.0000	0.0000	0.0000	5.4446	37.3860	91.9789	(98)
Space heating efficiency (main heating system 1)													
	205.8457	205.8457	205.8457	205.8457	205.8457	0.0000	0.0000	0.0000	0.0000	205.8457	205.8457	205.8457	(210)
Space heating fuel (main heating system)													
	43.8198	24.6035	14.1596	3.3397	0.4494	0.0000	0.0000	0.0000	0.0000	2.6450	18.1622	44.6834	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(64)
Efficiency of water heater												215.5777	(216)
(217)m	215.5777	215.5777	215.5777	215.5777	215.5777	215.5777	215.5777	215.5777	215.5777	215.5777	215.5777	215.5777	(217)
Fuel for water heating, kWh/month													
	129.4599	115.0544	123.3774	110.9038	109.2247	86.0801	85.4978	88.3490	88.7342	112.5832	117.0936	128.3377	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.8302	7.9756	8.8302	8.5453	8.8302	8.5453	8.8302	8.8302	8.5453	8.8302	8.5453	8.8302	(231)
Lighting	16.7991	13.4769	12.1344	8.8902	6.8671	5.6104	6.2644	8.1426	10.5765	13.8769	15.6740	17.2660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.2177	-62.1476	-91.0040	-102.5437	-111.2985	-101.0107	-99.8406	-94.7413	-83.9529	-70.9602	-47.5256	-37.1178	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												151.8626	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												215.5777	
Water heating fuel used												1294.6958	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9681	(230a)
Total electricity for the above, kWh/year	103.9681	(231)
Electricity for lighting (calculated in Appendix L)	135.5786	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-945.3606	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	740.7445	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	151.8626	0.1591	24.1681	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1294.6958	0.1414	183.1163	(264)
Space and water heating			207.2845	(265)
Pumps, fans and electric keep-hot	103.9681	0.1387	14.4217	(267)
Energy for lighting	135.5786	0.1443	19.5682	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-945.3606	0.1346	-127.2009	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-127.2009	(269)
Total CO2, kg/year			114.0734	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.1800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	151.8626	1.5891	241.3199	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1294.6958	1.5230	1971.8491	(278)
Space and water heating			2213.1690	(279)
Pumps, fans and electric keep-hot	103.9681	1.5128	157.2829	(281)
Energy for lighting	135.5786	1.5338	207.9550	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-945.3606	1.4973	-1415.4778	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1415.4778	(283)
Total Primary energy kWh/year			1162.9292	(286)
Dwelling Primary energy Rate (DPER)			22.1800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b) x	2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.5610	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3791	0.3715	0.3336	0.3260	0.2881	0.2881	0.2805	0.3032	0.3260	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2700	1.1450	9.4695			(27)
External Wall 1	29.0000	10.9100	18.0900	0.1800	3.2562			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.0000	18.3200	0.1800	3.2976			(29a)
Total net area of external elements Aum(A, m2)			49.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.8633			(33)
Main dwelling								
Party Wall 1			36.6100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.8000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	21.8000	0.0700	1.5260
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.0000	0.0200	0.3000
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E2 Other lintels (including other steel lintels)	6.4000	0.0500	0.3200
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.5470 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.4103 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8492	26.7136	26.5807	25.9565	25.8397	25.2960	25.2960	25.1953	25.5054	25.8397	26.0760	26.3230	(38)
Heat transfer coeff													
	52.2595	52.1239	51.9910	51.3668	51.2500	50.7063	50.7063	50.6056	50.9157	51.2500	51.4862	51.7333	(39)
Average = Sum(39)m / 12 =												51.3662	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9967	0.9942	0.9916	0.9797	0.9775	0.9671	0.9671	0.9652	0.9711	0.9775	0.9820	0.9867	(40)
HLP (average)												0.9797	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m													
	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	220.2879	194.9228	207.1753	182.1817	176.6652	159.2433	157.1104	163.2571	164.9650	183.9053	195.5256	217.8685	(62)
WWHRS	-24.5761	-21.7353	-22.7599	-18.8461	-17.5639	-15.0296	-14.0878	-14.9810	-15.5502	-18.3319	-20.7679	-24.1210	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	195.7118	173.1876	184.4154	163.3356	159.1013	144.2138	143.0226	148.2761	149.4148	165.5734	174.7578	193.7476	(64)
										Total per year (kWh/year) = Sum(64)m =		1994.7576	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.0288	84.4869	90.6689	81.6558	80.5243	74.0288	74.0223	76.0661	75.9313	82.9316	86.0927	94.2244	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.0251	89.7063	81.0251	83.7259	81.0251	83.7259	81.0251	81.0251	83.7259	81.0251	83.7259	81.0251	(67)

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

	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663 (68)

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

	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)

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

	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702 (71)

Water heating gains (Table 5)

	127.7269	125.7246	121.8668	113.4109	108.2316	102.8178	99.4924	102.2394	105.4601	111.4673	119.5732	126.6457 (72)

Total internal gains

	414.7192	422.9914	406.4374	392.1349	373.4651	357.6114	344.8105	345.9642	355.9008	370.7546	392.3510	406.8634 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.1800	36.7938	0.6300	0.7000	0.7700	24.5134	(77)
Southwest	6.0900	36.7938	0.6300	0.7000	0.7700	68.4801	(79)

Solar gains	92.9935	158.4023	216.7329	268.5425	300.7900	298.6149	287.8966	263.8385	234.6759	175.0682	111.3847	79.5830 (83)
Total gains	507.7127	581.3937	623.1703	660.6774	674.2551	656.2263	632.7071	609.8028	590.5767	545.8228	503.7357	486.4464 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6710	69.8523	70.0308	70.8819	71.0434	71.8051	71.8051	71.9480	71.5098	71.0434	70.7174	70.3797	
alpha	5.6447	5.6568	5.6687	5.7255	5.7362	5.7870	5.7870	5.7965	5.7673	5.7362	5.7145	5.6920	
util living area	0.9798	0.9578	0.9181	0.8241	0.6755	0.4902	0.3521	0.3808	0.5825	0.8412	0.9560	0.9835	(86)
MIT	20.2107	20.4059	20.6173	20.8374	20.9554	20.9941	20.9993	20.9989	20.9845	20.8441	20.5063	20.1767	(87)
Th 2	20.0860	20.0882	20.0903	20.1003	20.1021	20.1108	20.1108	20.1124	20.1075	20.1021	20.0984	20.0944	(88)
util rest of house	0.9741	0.9469	0.8979	0.7867	0.6201	0.4241	0.2812	0.3079	0.5122	0.7990	0.9427	0.9788	(89)
MIT 2	19.1944	19.4370	19.6931	19.9498	20.0683	20.1077	20.1106	20.1120	20.0984	19.9643	19.5724	19.1585	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	19.6770	19.8971	20.1321	20.3713	20.4896	20.5286	20.5326	20.5332	20.5192	20.3822	20.0159	19.6420	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6770	19.8971	20.1321	20.3713	20.4896	20.5286	20.5326	20.5332	20.5192	20.3822	20.0159	19.6420	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9711	0.9442	0.8989	0.7986	0.6446	0.4554	0.3149	0.3425	0.5451	0.8131	0.9413	0.9759	(94)
Useful gains	493.0209	548.9608	560.1866	527.6010	434.6316	298.8327	199.2385	208.8851	321.9368	443.7881	474.1716	474.7239	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	803.5958	781.7097	708.7442	589.2443	450.4658	300.6196	199.4097	209.1635	326.8386	501.3350	664.9920	798.8663	(97)
Space heating kWh	231.0677	156.4073	110.5269	44.3832	11.7806	0.0000	0.0000	0.0000	0.0000	42.8149	137.3907	241.1620	(98a)
Space heating requirement - total per year (kWh/year)												975.5333	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	231.0677	156.4073	110.5269	44.3832	11.7806	0.0000	0.0000	0.0000	0.0000	42.8149	137.3907	241.1620	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												975.5333	
Space heating per m2											(98c) / (4) =	18.6064	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	231.0677	156.4073	110.5269	44.3832	11.7806	0.0000	0.0000	0.0000	0.0000	42.8149	137.3907	241.1620	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	250.3443	169.4554	119.7474	48.0858	12.7634	0.0000	0.0000	0.0000	0.0000	46.3866	148.8523	261.2806	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	195.7118	173.1876	184.4154	163.3356	159.1013	144.2138	143.0226	148.2761	149.4148	165.5734	174.7578	193.7476	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4332	83.8320	82.9505	81.5664	80.3615	79.8000	79.8000	79.8000	79.8000	81.4970	83.5260	84.5518	(217)
Fuel for water heating, kWh/month	231.7949	206.5889	222.3198	200.2486	197.9820	180.7190	179.2263	185.8097	187.2366	203.1649	209.2255	229.1465	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8354	13.5060	12.1606	8.9094	6.8819	5.6226	6.2779	8.1602	10.5993	13.9069	15.7078	17.3033	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	-18.0344	-26.3504	-39.2477	-45.7962	-50.8571	-48.0381	-47.4820	-44.1143	-38.3927	-30.9010	-20.1642	-15.4880	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5549	-16.1362	-32.5183	-49.4871	-66.0504	-66.5622	-65.7474	-55.3591	-40.1926	-23.2535	-10.1465	-5.9538	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1056.9158	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2433.4627	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.8280	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2848.4218	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1056.9158	0.2100	221.9523	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2433.4627	0.2100	511.0272	(264)
Space and water heating			732.9795	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8714	0.1443	19.6104	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	0.1338	-56.8542	
PV Unit electricity exported	-438.9620	0.1255	-55.0999	
Total			-111.9542	(269)
Total CO2, kg/year			652.5650	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1056.9158	1.1300	1194.3148	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2433.4627	1.1300	2749.8129	(278)
Space and water heating			3944.1277	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8714	1.5338	208.4040	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	1.4945	-634.9711	
PV Unit electricity exported	-438.9620	0.4607	-202.2474	
Total			-837.2185	(283)
Total Primary energy kWh/year			3445.4141	(286)
Target Primary Energy Rate (TPER)			65.7100	(287)

Full SAP Calculation Printout

Property Reference	FLAT 12	**Issued on Date**	17/06/2025
Assessment Reference	Flat 12	**Prop Type Ref**	
Property			

SAP Rating	95 A	**DER**	1.54	**TER**	12.82
Environmental	99 A	**% DER < TER**			87.99
CO_2 Emissions (t/year)	0.07	**DFEE**	31.67	**TFEE**	31.55
Compliance Check	See BREL	**% DFEE < TFEE**			-0.37
% DPER < TPER	77.39	**DPER**	15.31	**TPER**	67.71

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0300	(1b)	x 2.7000	(2b) =	162.0810	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	162.0810	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		75.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			12.3200	0.8687	10.7027			(27)
OPAQUE			5.2800	0.9000	4.7520			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	53.0000	17.6000	35.4000	0.1200	4.2480			(29a)
EXPOSED WALL TO CORRIDOR	8.3700	2.2000	6.1700	0.1200	0.7404			(29a)
Total net area of external elements Aum(A, m2)			61.3700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.4231			(33)
Main dwelling								
Party Wall 1			28.4800	0.0000	0.0000			(32)
Party Floor 1			60.0300					(32d)
Party Ceiling 1			60.0300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.7500	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	28.7000	0.0700	2.0090	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	16.8000	0.0800	1.3440	
E16 Corner (normal)	13.5000	0.0900	1.2150	
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860	
E25 Staggered party wall between dwellings	8.1000	0.0800	0.6480	
E18 Party wall between dwellings	2.7000	0.0600	0.1620	
P8 Party Wall - Exposed floor (inverted)	4.3600	0.2400	1.0464	
E2 Other lintels (including other steel lintels)	9.0000	0.2000	1.8000	
E3 Sill	5.6000	0.0400	0.2240	
E4 Jamb	39.6000	0.0500	1.9800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3655 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3273	15.1568	14.9863	14.1339	13.9634	13.1109	13.1109	12.9404	13.4519	13.9634	14.3044	14.6453	(38)
Heat transfer coeff	47.6928	47.5223	47.3518	46.4994	46.3289	45.4764	45.4764	45.3059	45.8174	46.3289	46.6699	47.0108	(39)

Average = Sum(39)m / 12 = 46.4567

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7945	0.7916	0.7888	0.7746	0.7718	0.7576	0.7576	0.7547	0.7632	0.7718	0.7774	0.7831	(40)
HLP (average)												0.7739	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	57.4593	56.5958	55.3375	52.9300	51.1533	49.1720	48.0458	49.2945	50.6634	52.7908	55.2500	57.2391	(42a)
Hot water usage for baths	24.8326	24.4638	23.9445	22.9869	22.2698	21.4748	21.0453	21.5610	22.1226	22.9733	23.9506	24.7486	(42b)
Hot water usage for other uses	34.9326	33.6623	32.3920	31.1218	29.8515	28.5812	28.5812	29.8515	31.1218	32.3920	33.6623	34.9326	(42c)

Average daily hot water use (litres/day) 107.7562 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.2245	114.7219	111.6740	107.0386	103.2746	99.2280	97.6723	100.7071	103.9077	108.1561	112.8629	116.9204	(44)
Energy conte	185.6549	163.3625	171.6388	146.5305	139.0275	122.0123	118.1262	124.6964	128.1286	146.7668	160.7939	183.0691	(45)

Energy content (annual) Total = Sum(45)m = 1789.8076

Distribution loss (46)m = 0.15 x (45)m	27.8482	24.5044	25.7458	21.9796	20.8541	18.3019	17.7189	18.7045	19.2193	22.0150	24.1191	27.4604	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)

Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	291.0487	258.5569	277.0326	248.5245	244.4213	193.4303	191.9248	198.4950	199.5466	252.1606	262.7879	288.4629	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	291.0487	258.5569	277.0326	248.5245	244.4213	193.4303	191.9248	198.4950	199.5466	252.1606	262.7879	288.4629	(64)

Total per year (kWh/year) = Sum(64)m = 2906.3922 (64)
12Total per year (kWh/year) 2906 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

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

Heat gains from water heating, kWh/month	105.6163	93.9571	100.9560	91.1918	90.1127	58.5787	57.8869	60.0715	60.6124	92.6861	95.9344	104.7565	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.6677	97.0607	87.6677	90.5900	87.6677	90.5900	87.6677	87.6677	90.5900	87.6677	90.5900	87.6677	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.0226	174.8180	170.2936	160.6616	148.5030	137.0755	129.4413	127.6459	132.1703	141.8023	153.9610	165.3884	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	(71)
Water heating gains (Table 5)	141.9575	139.8171	135.6935	126.6553	121.1193	81.3593	77.8049	80.7412	84.1838	124.5780	133.2422	140.8018	(72)
Total internal gains	455.3850	464.4330	446.3920	430.6441	410.0271	361.7620	347.6512	348.7920	359.6814	406.7853	430.5303	446.5951	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	75.3929	128.4219	175.7125	217.7163	243.8604	242.0969	233.4073	213.9026	190.2595	141.9336	90.3033	64.5206	(83)
Total gains	530.7778	592.8549	622.1045	648.3604	653.8875	603.8590	581.0585	562.6946	549.9408	548.7189	520.8336	511.1157	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	87.4084	87.7220	88.0378	89.6517	89.9817	91.6683	91.6683	92.0133	90.9861	89.9817	89.3242	88.6764	
alpha	6.8272	6.8481	6.8692	6.9768	6.9988	7.1112	7.1112	7.1342	7.0657	6.9988	6.9549	6.9118	
util living area													
	0.9782	0.9546	0.9116	0.8048	0.6463	0.4806	0.3443	0.3702	0.5699	0.8114	0.9481	0.9820	(86)
Living	20.4706	20.6195	20.7716	20.9217	20.9842	20.9984	20.9999	20.9998	20.9948	20.9299	20.7033	20.4491	
Non living	19.6581	19.8428	20.0261	20.2033	20.2659	20.2894	20.2902	20.2927	20.2822	20.2166	19.9577	19.6396	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7292	20.6195	20.7716	20.9217	20.9842	20.9984	20.9999	20.9998	20.9948	20.9299	20.7033	20.5262	(87)
Th 2	20.2581	20.2606	20.2630	20.2754	20.2779	20.2903	20.2903	20.2927	20.2853	20.2779	20.2729	20.2680	(88)
util rest of house													
	0.9725	0.9438	0.8923	0.7706	0.6003	0.4279	0.2888	0.3134	0.5130	0.7717	0.9342	0.9772	(89)
MIT 2	20.0189	19.8428	20.0261	20.2033	20.2659	20.2894	20.2902	20.2927	20.2822	20.2166	19.9577	19.7529	(90)
Living area fraction										fLA = Living area / (4) =		0.4844	(91)
MIT	20.3630	20.2191	20.3872	20.5513	20.6139	20.6328	20.6340	20.6352	20.6274	20.5621	20.3189	20.1275	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3630	20.2191	20.3872	20.5513	20.6139	20.6328	20.6340	20.6352	20.6274	20.5621	20.3189	20.1275	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9734	0.9432	0.8958	0.7841	0.6220	0.4534	0.3157	0.3409	0.5404	0.7880	0.9352	0.9762	(94)
Useful gains	516.6675	559.1604	557.2693	508.3605	406.7098	273.8031	183.4171	191.8217	297.2098	432.3845	487.0638	498.9351	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	766.0888	727.9981	657.5858	541.7785	412.9698	274.3520	183.4516	191.8804	299.0671	461.5339	616.9236	748.7643	(97)
Space heating kWh													
	185.5694	113.4589	74.6355	24.0610	4.6575	0.0000	0.0000	0.0000	0.0000	21.6871	93.4990	185.8729	(98a)
Space heating requirement - total per year (kWh/year)												703.4414	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	185.5694	113.4589	74.6355	24.0610	4.6575	0.0000	0.0000	0.0000	0.0000	21.6871	93.4990	185.8729	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												703.4414	
Space heating per m2											(98c) / (4) =	11.7182	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 279.5435 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	185.5694	113.4589	74.6355	24.0610	4.6575	0.0000	0.0000	0.0000	0.0000	21.6871	93.4990	185.8729	(98)
Space heating efficiency (main heating system 1)													
	279.5435	279.5435	279.5435	279.5435	279.5435	0.0000	0.0000	0.0000	0.0000	279.5435	279.5435	279.5435	(210)
Space heating fuel (main heating system)													
	66.3830	40.5872	26.6991	8.6072	1.6661	0.0000	0.0000	0.0000	0.0000	7.7581	33.4470	66.4916	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	291.0487	258.5569	277.0326	248.5245	244.4213	193.4303	191.9248	198.4950	199.5466	252.1606	262.7879	288.4629	(64)
Efficiency of water heater												288.6311	(216)
(217)m	288.6311	288.6311	288.6311	288.6311	288.6311	288.6311	288.6311	288.6311	288.6311	288.6311	288.6311	288.6311	(217)
Fuel for water heating, kWh/month													
	100.8376	89.5804	95.9815	86.1046	84.6829	67.0165	66.4948	68.7712	69.1355	87.3643	91.0463	99.9417	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1101	9.1317	10.1101	9.7840	10.1101	9.7840	10.1101	10.1101	9.7840	10.1101	9.7840	10.1101	(231)
Lighting	18.2156	14.6132	13.1576	9.6398	7.4461	6.0835	6.7926	8.8292	11.4683	15.0470	16.9956	18.7219	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.6513	-62.8685	-91.9666	-102.9523	-110.7699	-100.9455	-99.7184	-94.4957	-83.7921	-71.0132	-47.9288	-37.4400	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 251.6393 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 288.6311

Water heating fuel used 1006.9574 (219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	119.0388	(230a)
Total electricity for the above, kWh/year	119.0388	(231)
Electricity for lighting (calculated in Appendix L)	147.0105	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-947.5422	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	577.1037	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	251.6393	0.1581	39.7938	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1006.9574	0.1414	142.4255	(264)
Space and water heating			182.2194	(265)
Pumps, fans and electric keep-hot	119.0388	0.1387	16.5121	(267)
Energy for lighting	147.0105	0.1443	21.2182	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-947.5422	0.1346	-127.5749	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-127.5749	(269)
Total CO2, kg/year			92.3747	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	251.6393	1.5854	398.9429	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1006.9574	1.5230	1533.6381	(278)
Space and water heating			1932.5809	(279)
Pumps, fans and electric keep-hot	119.0388	1.5128	180.0819	(281)
Energy for lighting	147.0105	1.5338	225.4895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-947.5422	1.4976	-1419.0475	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1419.0475	(283)
Total Primary energy kWh/year			919.1048	(286)
Dwelling Primary energy Rate (DPER)			15.3100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0300 (1b)	x	2.7000 (2b)	=	162.0810	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 60.0300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	162.0810	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3734	(18)
Number of sides sheltered		2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.3174	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4047	0.3967	0.3888	0.3491	0.3412	0.3015	0.3015	0.2936	0.3174	0.3412	0.3571	0.3729	(22b)
Effective ac	0.5819	0.5787	0.5756	0.5609	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5637	0.5695	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			7.4800	1.0000	7.4800			(26)
TER Opening Type			7.5200	1.1450	8.6107			(27)
External Wall 1	53.0000	12.8000	40.2000	0.1800	7.2360			(29a)
EXPOSED WALL TO CORRIDOR	8.3700	2.2000	6.1700	0.1800	1.1106			(29a)
Total net area of external elements Aum(A, m2)			61.3700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.4373			(33)
Main dwelling								
Party Wall 1			28.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			250.0000 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.7500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	28.7000	0.0700	2.0090
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	16.8000	0.0200	0.3360
E16 Corner (normal)	13.5000	0.0900	1.2150
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
E25 Staggered party wall between dwellings	8.1000	0.0600	0.4860
E18 Party wall between dwellings	2.7000	0.0600	0.1620
P8 Party Wall - Exposed floor (inverted)	4.3600	0.2400	1.0464
E2 Other lintels (including other steel lintels)	9.0000	0.0500	0.4500
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	39.6000	0.0500	1.9800
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.4784 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	31.9157 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.1227	30.9527	30.7860	30.0031	29.8566	29.1747	29.1747	29.0484	29.4373	29.8566	30.1529	30.4627	(38)
Heat transfer coeff	63.0384	62.8684	62.7017	61.9187	61.7723	61.0904	61.0904	60.9641	61.3530	61.7723	62.0686	62.3784	(39)
Average = Sum(39)m / 12 =												61.9180	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0501	1.0473	1.0445	1.0315	1.0290	1.0177	1.0177	1.0156	1.0220	1.0290	1.0340	1.0391	(40)
HLP (average)												1.0315	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9825 (42)
Hot water usage for mixer showers												
	57.4593	56.5958	55.3375	52.9300	51.1533	49.1720	48.0458	49.2945	50.6634	52.7908	55.2500	57.2391 (42a)
Hot water usage for baths												
	24.8326	24.4638	23.9445	22.9869	22.2698	21.4748	21.0453	21.5610	22.1226	22.9733	23.9506	24.7486 (42b)
Hot water usage for other uses												
	34.9326	33.6623	32.3920	31.1218	29.8515	28.5812	28.5812	29.8515	31.1218	32.3920	33.6623	34.9326 (42c)
Average daily hot water use (litres/day)												107.7562 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	117.2245	114.7219	111.6740	107.0386	103.2746	99.2280	97.6723	100.7071	103.9077	108.1561	112.8629	116.9204	(44)
Energy conte	185.6549	163.3625	171.6388	146.5305	139.0275	122.0123	118.1262	124.6964	128.1286	146.7668	160.7939	183.0691	(45)
Energy content (annual)										Total = Sum(45)m =		1789.8076	
Distribution loss (46)m = 0.15 x (45)m													
	27.8482	24.5044	25.7458	21.9796	20.8541	18.3019	17.7189	18.7045	19.2193	22.0150	24.1191	27.4604	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	232.2498	205.4482	218.2337	191.6224	185.6224	167.1042	164.7211	171.2913	173.2205	193.3617	205.8858	229.6640	(62)
WWHRS	-26.2680	-23.2316	-24.3268	-20.1436	-18.7731	-16.0643	-15.0577	-16.0123	-16.6207	-19.5940	-22.1976	-25.7815	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	205.9818	182.2166	193.9069	171.4788	166.8493	151.0399	149.6634	155.2789	156.5998	173.7678	183.6882	203.8824	(64)
										Total per year (kWh/year) = Sum(64)m =		2094.3539	(64)
12Total per year (kWh/year)												2094	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	99.0062	87.9866	94.3458	84.7949	83.5026	76.6426	76.5529	78.7375	78.6762	86.0759	89.5375	98.1464	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	(66)

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

	95.9478	106.2279	95.9478	99.1460	95.9478	99.1460	95.9478	95.9478	99.1460	95.9478	99.1460	95.9478 (67)

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

	173.0226	174.8180	170.2936	160.6616	148.5030	137.0755	129.4413	127.6459	132.1703	141.8023	153.9610	165.3884 (68)

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

	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)

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

	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993 (71)

Water heating gains (Table 5)

	133.0728	130.9324	126.8089	117.7707	112.2346	106.4480	102.8937	105.8299	109.2726	115.6934	124.3576	131.9172 (72)

Total internal gains

	457.7804	467.7156	448.7875	433.3155	412.4226	395.4068	381.0200	382.1608	393.3262	409.1807	433.2018	448.9906 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.7600	36.7938	0.6300	0.7000	0.7700	42.2800	(77)
Southwest	3.7600	36.7938	0.6300	0.7000	0.7700	42.2800	(79)

Solar gains	84.5599	144.0369	197.0775	244.1886	273.5116	271.5337	261.7875	239.9112	213.3933	159.1914	101.2833	72.3657 (83)
Total gains	542.3404	611.7525	645.8650	677.5041	685.9342	666.9405	642.8075	622.0720	606.7194	568.3722	534.4851	521.3563 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.1303	66.3092	66.4855	67.3261	67.4858	68.2391	68.2391	68.3804	67.9469	67.4858	67.1636	66.8300	
alpha	5.4087	5.4206	5.4324	5.4884	5.4991	5.5493	5.5493	5.5587	5.5298	5.4991	5.4776	5.4553	
util living area	0.9864	0.9731	0.9492	0.8851	0.7625	0.5733	0.4162	0.4478	0.6659	0.8929	0.9711	0.9887	(86)
MIT	20.0582	20.2414	20.4608	20.7270	20.9060	20.9842	20.9977	20.9966	20.9647	20.7536	20.3729	20.0295	(87)
Th 2	20.0418	20.0441	20.0464	20.0572	20.0592	20.0686	20.0686	20.0704	20.0650	20.0592	20.0551	20.0509	(88)
util rest of house	0.9824	0.9655	0.9347	0.8540	0.7064	0.4955	0.3292	0.3589	0.5880	0.8576	0.9615	0.9854	(89)
MIT 2	18.9692	19.2001	19.4724	19.7943	19.9847	20.0601	20.0679	20.0692	20.0434	19.8322	19.3758	18.9399	(90)
Living area fraction									fLA = Living area / (4) =			0.4844	(91)
MIT	19.4968	19.7045	19.9512	20.2461	20.4310	20.5078	20.5183	20.5185	20.4897	20.2786	19.8588	19.4678	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4968	19.7045	19.9512	20.2461	20.4310	20.5078	20.5183	20.5185	20.4897	20.2786	19.8588	19.4678	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9622	0.9330	0.8608	0.7296	0.5328	0.3714	0.4021	0.6245	0.8667	0.9591	0.9827	(94)
Useful gains	531.2048	588.6320	602.5948	583.1952	500.4644	355.3235	238.7469	250.1109	378.8701	492.6082	512.6038	512.3556	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	957.9804	930.7362	843.4124	702.5378	539.3343	360.9081	239.3732	251.0796	392.0260	597.8669	791.9222	952.3794	(97)
Space heating kWh	317.5210	229.8940	179.1683	85.9266	28.9192	0.0000	0.0000	0.0000	0.0000	78.3125	201.1093	327.3777	(98a)
Space heating requirement - total per year (kWh/year)												1448.2286	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	317.5210	229.8940	179.1683	85.9266	28.9192	0.0000	0.0000	0.0000	0.0000	78.3125	201.1093	327.3777	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1448.2286	
Space heating per m2										(98c) / (4) =		24.1251	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	317.5210	229.8940	179.1683	85.9266	28.9192	0.0000	0.0000	0.0000	0.0000	78.3125	201.1093	327.3777	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	344.0097	249.0726	194.1151	93.0949	31.3318	0.0000	0.0000	0.0000	0.0000	84.8456	217.8865	354.6888	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	205.9818	182.2166	193.9069	171.4788	166.8493	151.0399	149.6634	155.2789	156.5998	173.7678	183.6882	203.8824	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0268	84.5821	83.8829	82.5944	81.0129	79.8000	79.8000	79.8000	79.8000	82.3943	84.2634	85.1160	(217)
Fuel for water heating, kWh/month	242.2551	215.4315	231.1638	207.6155	205.9540	189.2731	187.5481	194.5852	196.2403	210.8978	217.9928	239.5349	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)

Lighting	19.9361	15.9934	14.4003	10.5503	8.1493	6.6581	7.4341	9.6631	12.5515	16.4682	18.6008	20.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.5668	-30.0036	-44.6109	-51.9478	-57.5806	-54.3346	-53.6972	-49.9415	-43.5446	-35.1353	-22.9769	-17.6675	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.7317	-18.6416	-37.5580	-57.1473	-76.2732	-76.8776	-75.9453	-63.9510	-46.4320	-26.8692	-11.7276	-6.8824	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1569.0450	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2538.4921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.8954	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-989.0444	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3365.3881	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1569.0450	0.2100	329.4995	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2538.4921	0.2100	533.0833	(264)
Space and water heating			862.5828	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8954	0.1443	23.2222	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-482.0073	0.1339	-64.5218	
PV Unit electricity exported	-507.0371	0.1255	-63.6455	
Total			-128.1672	(269)
Total CO2, kg/year			769.5670	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1569.0450	1.1300	1773.0209	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2538.4921	1.1300	2868.4960	(278)
Space and water heating			4641.5169	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8954	1.5338	246.7867	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-482.0073	1.4947	-720.4490	
PV Unit electricity exported	-507.0371	0.4607	-233.6140	
Total			-954.0630	(283)
Total Primary energy kWh/year			4064.3414	(286)
Target Primary Energy Rate (TPER)			67.7100	(287)

Full SAP Calculation Printout

Property Reference	FLAT 13	**Issued on Date**	17/06/2025
Assessment Reference	Flat 13	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	1.97	**TER**	15.89
Environmental	99 A	**% DER < TER**			87.60
CO_2 Emissions (t/year)	0.08	**DFEE**	41.90	**TFEE**	43.38
Compliance Check	See BREL	**% DFEE < TFEE**			3.40
% DPER < TPER	76.68	**DPER**	19.64	**TPER**	84.24

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.8500	(1b)	x 2.7000	(2b) =	145.3950	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	145.3950	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			11.4400	0.8687	9.9382			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
Door			2.2000	0.9000	1.9800			(26)
EXPOSED FLOOR			27.4000	0.0900	2.4660			(28b)
Ext floor			10.3500	0.0900	0.9315			(28b)
External Wall 1	32.4000	14.0800	18.3200	0.1200	2.1984			(29a)
Exposed Internal Wall	27.0000	2.2000	24.8000	0.1200	2.9760			(29a)
Total net area of external elements Aum(A, m2)			97.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.8661			(33)
Main dwelling								
Party Wall 1			27.8000	0.0000	0.0000			(32)
Party Floor 1			16.1000					(32d)
Party Ceiling 1			53.8500					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	8.7000	0.0700	0.6090
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	12.1000	0.0800	0.9680
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	4.3000	0.0000	0.0000
E25	Staggered party wall between dwellings	10.8000	0.0800	0.8640
E16	Corner (normal)	5.4000	0.0900	0.4860
E17	Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E20	Exposed floor (normal)	12.2500	0.3200	3.9200
P8	Party Wall - Exposed floor (inverted)	24.0000	0.2400	5.7600
E24	Eaves (insulation at ceiling level - inverted)	3.7000	0.2400	0.8880
E2	Other lintels (including other steel lintels)	7.4000	0.2000	1.4800
E3	Sill	5.2000	0.0400	0.2080
E4	Jamb	30.8000	0.0500	1.5400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.4800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.3461 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0612	12.9217	12.7823	12.0851	11.9456	11.2484	11.2484	11.1090	11.5273	11.9456	12.2245	12.5034	(38)
Heat transfer coeff	52.4073	52.2678	52.1284	51.4312	51.2917	50.5945	50.5945	50.4551	50.8734	51.2917	51.5706	51.8495	(39)
Average = Sum(39)m / 12 =												51.3963	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9732	0.9706	0.9680	0.9551	0.9525	0.9395	0.9395	0.9370	0.9447	0.9525	0.9577	0.9629	(40)
HLP (average)												0.9544	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8036 (42)
Hot water usage for mixer showers

54.4598	53.6414	52.4488	50.1670	48.4830	46.6051	45.5377	46.7213	48.0187	50.0350	52.3659	54.2512	(42a)

Hot water usage for baths

23.5427	23.1931	22.7007	21.7929	21.1131	20.3593	19.9522	20.4411	20.9735	21.7800	22.7066	23.4631	(42b)

Hot water usage for other uses

33.1006	31.8969	30.6933	29.4896	28.2859	27.0823	27.0823	28.2859	29.4896	30.6933	31.8969	33.1006	(42c)

Average daily hot water use (litres/day) 102.1294 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.1031	108.7314	105.8428	101.4494	97.8821	94.0467	92.5722	95.4483	98.4818	102.5083	106.9693	110.8149	(44)
Energy conte	175.9602	154.8321	162.6764	138.8792	131.7681	115.6414	111.9580	118.1850	121.4379	139.1028	152.3974	173.5093	(45)
Energy content (annual)										Total = Sum(45)m =		1696.3477	

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

26.3940	23.2248	24.4015	20.8319	19.7652	17.3462	16.7937	17.7277	18.2157	20.8654	22.8596	26.0264	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)
Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

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

281.3540	250.0265	268.0702	240.8732	237.1619	187.0594	185.7566	191.9836	192.8559	244.4966	254.3914	278.9031	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

281.3540	250.0265	268.0702	240.8732	237.1619	187.0594	185.7566	191.9836	192.8559	244.4966	254.3914	278.9031	(64)

Total per year (kWh/year) = Sum(64)m = 2812.9323 (64)
12Total per year (kWh/year) 2813 (64)
Electric shower(s)

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

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

102.3928	91.1207	97.9760	88.6477	87.6990	56.4604	55.8360	57.9064	58.3877	90.1378	93.1425	101.5779	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.4551	87.9682	79.4551	82.1036	79.4551	82.1036	79.4551	79.4551	82.1036	79.4551	82.1036	79.4551	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.2172	158.8486	154.7374	145.9853	134.9374	124.5538	117.6170	115.9856	120.0967	128.8488	139.8968	150.2803	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	(71)
Water heating gains (Table 5)	137.6248	135.5963	131.6881	123.1219	117.8749	78.4172	75.0483	77.8312	81.0940	121.1529	129.3646	136.5295	(72)
Total internal gains	424.3509	432.4669	415.9346	401.2647	382.3213	335.1285	322.1743	323.3258	333.3482	379.5107	401.4189	416.3188	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(77)

Southwest				2.2000		36.7938		0.3000		0.8000		0.7700	13.4630 (79)
Solar gains	70.0077	119.2489	163.1616	202.1651	226.4418	224.8043	216.7353	198.6238	176.6695	131.7955	83.8530	59.9120 (83)	
Total gains	494.3586	551.7158	579.0962	603.4298	608.7631	559.9328	538.9096	521.9496	510.0177	511.3062	485.2720	476.2308 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.3562	71.5466	71.7379	72.7104	72.9081	73.9128	73.9128	74.1171	73.5076	72.9081	72.5138	72.1238	
alpha	5.7571	5.7698	5.7825	5.8474	5.8605	5.9275	5.9275	5.9411	5.9005	5.8605	5.8343	5.8083	
util living area													
	0.9834	0.9680	0.9400	0.8668	0.7336	0.5686	0.4118	0.4427	0.6626	0.8717	0.9644	0.9862 (86)	
Living	20.1998	20.3673	20.5646	20.7951	20.9372	20.9887	20.9986	20.9978	20.9730	20.8188	20.4866	20.1727	
Non living	19.1964	19.4066	19.6494	19.9258	20.0739	20.1279	20.1336	20.1354	20.1130	19.9588	19.5660	19.1693	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5906	20.3673	20.5646	20.7951	20.9372	20.9887	20.9986	20.9978	20.9730	20.8188	20.4866	20.2884 (87)	
Th 2	20.1057	20.1079	20.1101	20.1209	20.1231	20.1340	20.1340	20.1362	20.1297	20.1231	20.1188	20.1144 (88)	
util rest of house													
	0.9787	0.9594	0.9240	0.8342	0.6792	0.4959	0.3315	0.3606	0.5891	0.8340	0.9532	0.9822 (89)	
MIT 2	19.7432	19.4066	19.6494	19.9258	20.0739	20.1279	20.1336	20.1354	20.1130	19.9588	19.5660	19.3396 (90)	
Living area fraction										fLA = Living area / (4) =		0.5222 (91)	
MIT	20.1857	19.9083	20.1273	20.3797	20.5247	20.5774	20.5853	20.5858	20.5621	20.4079	20.0467	19.8351 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.1857	19.9083	20.1273	20.3797	20.5247	20.5774	20.5853	20.5858	20.5621	20.4079	20.0467	19.8351 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9571	0.9244	0.8445	0.7049	0.5336	0.3735	0.4035	0.6265	0.8472	0.9521	0.9807 (94)	
Useful gains	484.0631	528.0477	535.3085	509.5887	429.1115	298.7623	201.2600	210.6105	319.5487	433.1822	462.0442	467.0432 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
	832.5280	784.4495	710.3688	590.4156	452.6330	302.4239	201.6321	211.1936	328.7478	503.0638	667.6708	810.6702 (97)	
Space heating kWh													
	259.2579	172.3020	130.2449	58.1953	17.5000	0.0000	0.0000	0.0000	0.0000	51.9919	148.0511	255.6584 (98a)	
Space heating requirement - total per year (kWh/year)												1093.2017	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	259.2579	172.3020	130.2449	58.1953	17.5000	0.0000	0.0000	0.0000	0.0000	51.9919	148.0511	255.6584 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1093.2017	
Space heating per m2											(98c) / (4) =	20.3009 (99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Efficiency of main space heating system 1 (in %)												291.1786 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	259.2579	172.3020	130.2449	58.1953	17.5000	0.0000	0.0000	0.0000	0.0000	51.9919	148.0511	255.6584 (98)	
Space heating efficiency (main heating system 1)													
	291.1786	291.1786	291.1786	291.1786	291.1786	0.0000	0.0000	0.0000	0.0000	291.1786	291.1786	291.1786 (210)	
Space heating fuel (main heating system)													
	89.0374	59.1740	44.7303	19.9861	6.0101	0.0000	0.0000	0.0000	0.0000	17.8557	50.8455	87.8013 (211)	
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement													
	281.3540	250.0265	268.0702	240.8732	237.1619	187.0594	185.7566	191.9836	192.8559	244.4966	254.3914	278.9031 (64)	
Efficiency of water heater												288.6930 (216)	
(217)m	288.6930	288.6930	288.6930	288.6930	288.6930	288.6930	288.6930	288.6930	288.6930	288.6930	288.6930	288.6930 (217)	
Fuel for water heating, kWh/month													
	97.4579	86.6064	92.8565	83.4358	82.1502	64.7953	64.3440	66.5009	66.8031	84.6909	88.1183	96.6089 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	9.0693	8.1916	9.0693	8.7768	9.0693	8.7768	9.0693	9.0693	8.7768	9.0693	8.7768	9.0693 (231)	
Lighting	16.5092	13.2443	11.9250	8.7368	6.7485	5.5136	6.1562	8.0021	10.3940	13.6374	15.4035	16.9680 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.6188	-62.7000	-91.4436	-101.3390	-107.2340	-96.3260	-95.1937	-90.5361	-80.7150	-70.1269	-47.7959	-37.4035 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												375.4403 (211)	
Space heating fuel - main system 2												0.0000 (213)	

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.6930	
Water heating fuel used	974.3681	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	106.7839	(230a)
Total electricity for the above, kWh/year	106.7839	(231)
Electricity for lighting (calculated in Appendix L)	133.2388	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-924.4326	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	665.3985	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	375.4403	0.1569	58.8937	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	974.3681	0.1414	137.8116	(264)
Space and water heating			196.7053	(265)
Pumps, fans and electric keep-hot	106.7839	0.1387	14.8122	(267)
Energy for lighting	133.2388	0.1443	19.2305	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-924.4326	0.1349	-124.7432	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-124.7432	(269)
Total CO2, kg/year			106.0048	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	375.4403	1.5807	593.4604	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	974.3681	1.5230	1483.9871	(278)
Space and water heating			2077.4475	(279)
Pumps, fans and electric keep-hot	106.7839	1.5128	161.5427	(281)
Energy for lighting	133.2388	1.5338	204.3660	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-924.4326	1.4987	-1385.4923	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1385.4923	(283)
Total Primary energy kWh/year			1057.8639	(286)
Dwelling Primary energy Rate (DPER)			19.6400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.8500	(1b)	x 2.7000	(2b)	= 145.3950	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 145.3950	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1376	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3876	(18)
Number of sides sheltered		3	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3004 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3830	0.3754	0.3679	0.3304	0.3229	0.2853	0.2853	0.2778	0.3004	0.3229	0.3379	0.3529	(22b)
Effective ac	0.5733	0.5705	0.5677	0.5546	0.5521	0.5407	0.5407	0.5386	0.5451	0.5521	0.5571	0.5623	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.6200	1.1450	9.8702			(27)
EXPOSED FLOOR			27.4000	0.1300	3.5620			(28b)
Ext floor			10.3500	0.1300	1.3455			(28b)
External Wall 1	32.4000	11.2600	21.1400	0.1800	3.8052			(29a)
Exposed Internal Wall	27.0000	2.2000	24.8000	0.1800	4.4640			(29a)
Total net area of external elements Aum(A, m2)			97.1500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.8869			(33)
Main dwelling								
Party Wall 1			27.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.7000	0.0700	0.6090
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	12.1000	0.0200	0.2420
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.3000	0.0000	0.0000
E25 Staggered party wall between dwellings	10.8000	0.0600	0.6480
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E20 Exposed floor (normal)	12.2500	0.3200	3.9200
P8 Party Wall - Exposed floor (inverted)	24.0000	0.2400	5.7600
E24 Eaves (insulation at ceiling level - inverted)	3.7000	0.2400	0.8880
E2 Other lintels (including other steel lintels)	7.4000	0.0500	0.3700
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	30.8000	0.0500	1.5400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.4800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.3669 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.5084	27.3718	27.2379	26.6089	26.4912	25.9434	25.9434	25.8420	26.1544	26.4912	26.7293	26.9782	(38)
Heat transfer coeff	69.8754	69.7387	69.6048	68.9758	68.8582	68.3103	68.3103	68.2089	68.5213	68.8582	69.0962	69.3451	(39)
Average = Sum(39)m / 12 =												68.9753	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2976	1.2951	1.2926	1.2809	1.2787	1.2685	1.2685	1.2666	1.2724	1.2787	1.2831	1.2877	(40)
HLP (average)												1.2809	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8036 (42)
Hot water usage for mixer showers
54.4598 53.6414 52.4488 50.1670 48.4830 46.6051 45.5377 46.7213 48.0187 50.0350 52.3659 54.2512 (42a)
Hot water usage for baths
23.5427 23.1931 22.7007 21.7929 21.1131 20.3593 19.9522 20.4411 20.9735 21.7800 22.7066 23.4631 (42b)
Hot water usage for other uses
33.1006 31.8969 30.6933 29.4896 28.2859 27.0823 27.0823 28.2859 29.4896 30.6933 31.8969 33.1006 (42c)
Average daily hot water use (litres/day) 102.1294 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.1031	108.7314	105.8428	101.4494	97.8821	94.0467	92.5722	95.4483	98.4818	102.5083	106.9693	110.8149	(44)
Energy conte	175.9602	154.8321	162.6764	138.8792	131.7681	115.6414	111.9580	118.1850	121.4379	139.1028	152.3974	173.5093	(45)
Energy content (annual)										Total = Sum(45)m =		1696.3477	
Distribution loss (46)m = 0.15 x (45)m	26.3940	23.2248	24.4015	20.8319	19.7652	17.3462	16.7937	17.7277	18.2157	20.8654	22.8596	26.0264	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	222.5551	196.9178	209.2713	183.9710	178.3630	160.7333	158.5529	164.7799	166.5297	185.6977	197.4893	220.1042	(62)
WWHRS	-24.8968	-22.0189	-23.0569	-19.0920	-17.7931	-15.2257	-14.2716	-15.1765	-15.7531	-18.5711	-21.0388	-24.4357	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.6583	174.8989	186.2144	164.8790	160.5699	145.5076	144.2813	149.6034	150.7766	167.1265	176.4504	195.6685	(64)
									Total per year (kWh/year) = Sum(64)m =			2013.6349	(64)
12Total per year (kWh/year)												2014	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	95.7827	85.1502	91.3658	82.2508	81.0888	74.5242	74.5020	76.5724	76.4516	83.5276	86.7456	94.9678	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	90.1796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	82.7224	91.5856	82.7224	85.4798	82.7224	85.4798	82.7224	82.7224	85.4798	82.7224	85.4798	82.7224	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.2172	158.8486	154.7374	145.9853	134.9374	124.5538	117.6170	115.9856	120.0967	128.8488	139.8968	150.2803	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	32.0180	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	-72.1437	(71)
Water heating gains (Table 5)													
	128.7402	126.7117	122.8035	114.2372	108.9903	103.5059	100.1370	102.9199	106.1827	112.2683	120.4800	127.6449	(72)
Total internal gains													
	421.7336	430.1997	413.3173	398.7563	379.7040	363.5934	350.5303	351.6818	361.8131	376.8934	398.9105	413.7015	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.9600	36.7938	0.6300	0.7000	0.7700	78.2629	(77)
Southwest	1.6600	36.7938	0.6300	0.7000	0.7700	18.6662	(79)

Solar gains	96.9291	165.1061	225.9054	279.9077	313.5199	311.2527	300.0808	275.0046	244.6077	182.4774	116.0987	82.9511	(83)
Total gains	518.6627	595.3058	639.2226	678.6640	693.2239	674.8462	650.6112	626.6864	606.4209	559.3708	515.0092	496.6526	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.5179	53.6228	53.7259	54.2158	54.3085	54.7440	54.7440	54.8255	54.5754	54.3085	54.1214	53.9271	
alpha	4.5679	4.5749	4.5817	4.6144	4.6206	4.6496	4.6496	4.6550	4.6384	4.6206	4.6081	4.5951	
util living area													
	0.9862	0.9734	0.9509	0.8953	0.7880	0.6147	0.4550	0.4905	0.7079	0.9069	0.9729	0.9885	(86)
MIT	19.7294	19.9463	20.2212	20.5586	20.8170	20.9564	20.9912	20.9876	20.9152	20.5938	20.1072	19.6910	(87)
Th 2	19.8427	19.8447	19.8467	19.8558	19.8576	19.8656	19.8656	19.8671	19.8625	19.8576	19.8541	19.8504	(88)
util rest of house													
	0.9818	0.9654	0.9358	0.8630	0.7264	0.5193	0.3413	0.3748	0.6170	0.8713	0.9632	0.9849	(89)
MIT 2	18.4079	18.6812	19.0230	19.4318	19.7124	19.8424	19.8630	19.8631	19.8108	19.4829	18.8934	18.3649	(90)
Living area fraction									fLA = Living area / (4) =			0.5222	(91)
MIT	19.0980	19.3418	19.6487	20.0202	20.2892	20.4241	20.4522	20.4503	20.3875	20.0630	19.5273	19.0574	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0980	19.3418	19.6487	20.0202	20.2892	20.4241	20.4522	20.4503	20.3875	20.0630	19.5273	19.0574	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9782	0.9610	0.9327	0.8682	0.7513	0.5677	0.4009	0.4353	0.6611	0.8786	0.9598	0.9816	(94)
Useful gains	507.3605	572.1059	596.1896	589.2356	520.8159	383.1075	260.7985	272.8197	400.9301	491.4552	494.2844	487.5010	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1034.0145	1007.1562	915.2105	767.0239	591.4372	397.8466	263.1417	276.2649	430.8306	651.6048	858.6766	1030.2883	(97)
Space heating kWh													
	391.8305	292.3538	237.3515	128.0076	52.5422	0.0000	0.0000	0.0000	0.0000	119.1513	262.3624	403.8338	(98a)
Space heating requirement - total per year (kWh/year)												1887.4330	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	391.8305	292.3538	237.3515	128.0076	52.5422	0.0000	0.0000	0.0000	0.0000	119.1513	262.3624	403.8338	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1887.4330	
Space heating per m2											(98c) / (4) =	35.0498	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	391.8305	292.3538	237.3515	128.0076	52.5422	0.0000	0.0000	0.0000	0.0000	119.1513	262.3624	403.8338	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	424.5185	316.7430	257.1522	138.6864	56.9255	0.0000	0.0000	0.0000	0.0000	129.0913	284.2496	437.5230	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	197.6583	174.8989	186.2144	164.8790	160.5699	145.5076	144.2813	149.6034	150.7766	167.1265	176.4504	195.6685	(64)
Efficiency of water heater												79.8000	(216)

(217)m	85.5643	85.2031	84.6050	83.4987	81.8451	79.8000	79.8000	79.8000	79.8000	83.3145	84.9476	85.6473 (217)
Fuel for water heating, kWh/month												
	231.0057	205.2730	220.0985	197.4630	196.1874	182.3403	180.8036	187.4729	188.9431	200.5972	207.7168	228.4585 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.1881	13.7889	12.4154	9.0961	7.0261	5.7403	6.4094	8.3312	10.8214	14.1982	16.0369	17.6658 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.5049	-27.0284	-40.2431	-46.9389	-52.1076	-49.2101	-48.6375	-45.1950	-39.3463	-31.6850	-20.6860	-15.8929 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.7774	-16.6088	-33.4666	-50.9250	-67.9661	-68.4940	-67.6585	-56.9724	-41.3674	-23.9362	-10.4457	-6.1296 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2044.8895	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2426.3601	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	138.7177	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-887.2237	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3808.7437	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2044.8895	0.2100	429.4268	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2426.3601	0.2100	509.5356	(264)
Space and water heating			938.9624	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	138.7177	0.1443	20.0213	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-435.4757	0.1338	-58.2779	
PV Unit electricity exported	-451.7480	0.1255	-56.7057	
Total			-114.9836	(269)
Total CO2, kg/year			855.9294	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2044.8895	1.1300	2310.7252	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2426.3601	1.1300	2741.7870	(278)
Space and water heating			5052.5121	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	138.7177	1.5338	212.7699	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-435.4757	1.4946	-650.8420	
PV Unit electricity exported	-451.7480	0.4607	-208.1415	
Total			-858.9836	(283)
Total Primary energy kWh/year			4536.3992	(286)
Target Primary Energy Rate (TPER)			84.2400	(287)

Full SAP Calculation Printout

Property Reference	FLAT 14	**Issued on Date**	17/06/2025
Assessment Reference	Flat 14	**Prop Type Ref**	
Property			

SAP Rating	92 A	**DER**	2.46	**TER**	18.18
Environmental	98 A	**% DER < TER**			86.47
CO_2 Emissions (t/year)	0.1	**DFEE**	53.17	**TFEE**	52.66
Compliance Check	See BREL	**% DFEE < TFEE**			-0.96
% DPER < TPER	74.49	**DPER**	24.64	**TPER**	96.59

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.1600	(1b)	x 2.7000	(2b) =	138.1320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.1600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	138.1320	(5)

---

2. Ventilation rate

---

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			11.2200	0.8687	9.7471			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
Doors			2.2000	0.9000	1.9800			(26)
EXPOSED FLOOR			13.4100	0.0900	1.2069			(28b)
EXT floor			5.2800	0.0900	0.4752			(28a)
External Wall 1	61.0200	13.8600	47.1600	0.1200	5.6592			(29a)
Exposed Internal Wall	5.0000	2.2000	2.8000	0.1200	0.3360			(29a)
External Roof 1	61.0000		61.0000	0.1000	6.1000			(30)
Total net area of external elements Aum(A, m2)			145.7100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8804			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.0800	0.4560
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E20 Exposed floor (normal)	18.7500	0.3200	6.0000
P7 Party Wall - Exposed floor (normal)	7.8000	0.1600	1.2480
E24 Eaves (insulation at ceiling level - inverted)	5.9500	0.2400	1.4280
E14 Flat roof	5.7000	0.0800	0.4560
E10 Eaves (insulation at ceiling level)	10.7000	0.1200	1.2840
E12 Gable (insulation at ceiling level)	6.2000	0.4800	2.9760
E2 Other lintels (including other steel lintels)	7.3000	0.2000	1.4600
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	30.8000	0.0500	1.5400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.2130 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.0934 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0625	12.9172	12.7719	12.0455	11.9002	11.1737	11.1737	11.0284	11.4643	11.9002	12.1908	12.4813	(38)
Heat transfer coeff	59.1559	59.0106	58.8653	58.1389	57.9936	57.2671	57.2671	57.1218	57.5577	57.9936	58.2842	58.5748	(39)

Average = Sum(39)m / 12 = 58.1025

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1563	1.1535	1.1506	1.1364	1.1336	1.1194	1.1194	1.1165	1.1251	1.1336	1.1393	1.1449	(40)
HLP (average)												1.1357	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7243 (42)

Hot water usage for mixer showers

53.1302	52.3317	51.1682	48.9421	47.2993	45.4672	44.4259	45.5806	46.8463	48.8134	51.0873	52.9266	(42a)

Hot water usage for baths

22.9709	22.6298	22.1494	21.2636	20.6003	19.8649	19.4676	19.9446	20.4641	21.2510	22.1551	22.8933	(42b)

Hot water usage for other uses

32.2885	31.1143	29.9402	28.7661	27.5920	26.4178	26.4178	27.5920	28.7661	29.9402	31.1143	32.2885	(42c)

Average daily hot water use (litres/day) 99.6351 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.3896	106.0758	103.2578	98.9718	95.4916	91.7499	90.3113	93.1172	96.0765	100.0046	104.3567	108.1083	(44)
Energy conte	171.6626	151.0506	158.7034	135.4874	128.5500	112.8172	109.2237	115.2985	118.4719	135.7053	148.6753	169.2715	(45)

Energy content (annual) Total = Sum(45)m = 1654.9174

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

25.7494	22.6576	23.8055	20.3231	19.2825	16.9226	16.3836	17.2948	17.7708	20.3558	22.3013	25.3907	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.6302 (55)

Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

277.0564	246.2450	264.0972	237.4814	233.9438	184.2352	183.0223	189.0971	189.8899	241.0991	250.6693	274.6653	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

277.0564	246.2450	264.0972	237.4814	233.9438	184.2352	183.0223	189.0971	189.8899	241.0991	250.6693	274.6653	(64)

Total per year (kWh/year) = Sum(64)m = 2771.5020 (64)

12Total per year (kWh/year) 2772 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

100.9639	89.8634	96.6550	87.5200	86.6290	55.5213	54.9268	56.9467	57.4015	89.0081	91.9049	100.1689	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.8159	83.9391	75.8159	78.3431	75.8159	78.3431	75.8159	75.8159	78.3431	75.8159	78.3431	75.8159	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.2462	151.8053	147.8764	139.5124	128.9543	119.0311	112.4019	110.8428	114.7716	123.1357	133.6938	143.6169	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	(71)
Water heating gains (Table 5)	135.7041	133.7252	129.9126	121.5555	116.4368	77.1129	73.8263	76.5412	79.7243	119.6345	127.6457	134.6356	(72)
Total internal gains	410.6306	418.3339	402.4693	388.2754	370.0713	323.3516	310.9085	312.0643	321.7034	367.4505	388.5470	402.9328	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9800	11.2829	0.3000	0.8000	0.7700	3.7156	(75)

Southeast			6.1600		36.7938		0.3000		0.8000		0.7700		37.6964 (77)
Northwest			3.0800		11.2829		0.3000		0.8000		0.7700		5.7799 (81)
Solar gains	47.1919	83.5393	122.6798	166.0484	198.8051	203.0052	193.3725	168.0726	137.5627	94.5876	57.0994	40.0148	(83)
Total gains	457.8225	501.8732	525.1491	554.3237	568.8764	526.3568	504.2810	480.1369	459.2662	462.0381	445.6464	442.9475	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.0578	60.2057	60.3543	61.1085	61.2616	62.0388	62.0388	62.1966	61.7255	61.2616	60.9561	60.6537	
alpha	5.0039	5.0137	5.0236	5.0739	5.0841	5.1359	5.1359	5.1464	5.1150	5.0841	5.0637	5.0436	
util living area	0.9885	0.9803	0.9646	0.9173	0.8126	0.6594	0.4925	0.5358	0.7703	0.9248	0.9776	0.9901	(86)
Living	19.8795	20.0408	20.2730	20.5903	20.8380	20.9590	20.9924	20.9884	20.9087	20.6304	20.2138	19.8560	
Non living	18.6789	18.8838	19.1756	19.5675	19.8414	19.9620	19.9827	19.9834	19.9207	19.6233	19.1124	18.6559	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4268	20.0408	20.2730	20.5903	20.8380	20.9590	20.9924	20.9884	20.9087	20.6304	20.2138	20.0160	(87)
Th 2	19.9551	19.9574	19.9597	19.9712	19.9735	19.9850	19.9850	19.9874	19.9804	19.9735	19.9689	19.9643	(88)
util rest of house	0.9849	0.9744	0.9534	0.8910	0.7573	0.5697	0.3827	0.4237	0.6888	0.8955	0.9696	0.9870	(89)
MIT 2	19.4464	18.8838	19.1756	19.5675	19.8414	19.9620	19.9827	19.9834	19.9207	19.6233	19.1124	18.8917	(90)
Living area fraction										fLA = Living area / (4) =		0.4527	(91)
MIT	19.8902	19.4076	19.6724	20.0305	20.2925	20.4133	20.4397	20.4384	20.3680	20.0792	19.6110	19.4007	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8902	19.4076	19.6724	20.0305	20.2925	20.4133	20.4397	20.4384	20.3680	20.0792	19.6110	19.4007	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9846	0.9704	0.9496	0.8927	0.7758	0.6090	0.4326	0.4746	0.7220	0.8990	0.9662	0.9849	(94)
Useful gains	450.7859	487.0010	498.6902	494.8507	441.3317	320.5322	218.1341	227.8919	331.5932	415.3592	430.5670	436.2700	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	922.2531	856.1024	775.3984	647.1173	498.3124	332.9134	219.8912	230.6783	360.7696	549.7342	729.1923	890.3745	(97)
Space heating kWh	350.7716	248.0361	205.8709	109.6319	42.3936	0.0000	0.0000	0.0000	0.0000	99.9751	215.0102	337.8538	(98a)
Space heating requirement - total per year (kWh/year)												1609.5432	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	350.7716	248.0361	205.8709	109.6319	42.3936	0.0000	0.0000	0.0000	0.0000	99.9751	215.0102	337.8538	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1609.5432	
Space heating per m2											(98c) / (4) =	31.4610	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	304.9700 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	350.7716	248.0361	205.8709	109.6319	42.3936	0.0000	0.0000	0.0000	0.0000	99.9751	215.0102	337.8538	(98)
Space heating efficiency (main heating system 1)	304.9700	304.9700	304.9700	304.9700	304.9700	0.0000	0.0000	0.0000	0.0000	304.9700	304.9700	304.9700	(210)
Space heating fuel (main heating system)	115.0184	81.3313	67.5053	35.9484	13.9009	0.0000	0.0000	0.0000	0.0000	32.7819	70.5021	110.7826	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	277.0564	246.2450	264.0972	237.4814	233.9438	184.2352	183.0223	189.0971	189.8899	241.0991	250.6693	274.6653	(64)
Efficiency of water heater												288.8153	(216)
(217)m	288.8153	288.8153	288.8153	288.8153	288.8153	288.8153	288.8153	288.8153	288.8153	288.8153	288.8153	288.8153	(217)
Fuel for water heating, kWh/month	95.9286	85.2604	91.4416	82.2261	81.0012	63.7900	63.3700	65.4734	65.7479	83.4787	86.7922	95.1007	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.6163	7.7824	8.6163	8.3383	8.6163	8.3383	8.6163	8.6163	8.3383	8.6163	8.3383	8.6163	(231)
Lighting	15.7531	12.6377	11.3788	8.3366	6.4394	5.2611	5.8743	7.6356	9.9179	13.0128	14.6980	16.1909	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.9546	-63.3720	-92.7239	-102.5090	-107.0330	-94.1824	-93.0946	-88.6943	-79.2770	-70.6809	-48.1671	-37.6284	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												527.7709	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.8153	
Water heating fuel used	959.6105	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	101.4497	(230a)
Total electricity for the above, kWh/year	101.4497	(231)
Electricity for lighting (calculated in Appendix L)	127.1362	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-921.3173	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	794.6500	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	527.7709	0.1558	82.2266	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	959.6105	0.1414	135.7223	(264)
Space and water heating			217.9489	(265)
Pumps, fans and electric keep-hot	101.4497	0.1387	14.0723	(267)
Energy for lighting	127.1362	0.1443	18.3497	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-921.3173	0.1352	-124.5382	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-124.5382	(269)
Total CO2, kg/year			125.8326	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	527.7709	1.5768	832.1818	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	959.6105	1.5230	1461.5036	(278)
Space and water heating			2293.6854	(279)
Pumps, fans and electric keep-hot	101.4497	1.5128	153.4731	(281)
Energy for lighting	127.1362	1.5338	195.0057	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-921.3173	1.4996	-1381.6370	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1381.6370	(283)
Total Primary energy kWh/year			1260.5272	(286)
Dwelling Primary energy Rate (DPER)			24.6400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.1600	(1b) x	2.7000	(2b) =	138.1320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		138.1320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1448	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3948	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4279	0.4195	0.4111	0.3691	0.3607	0.3188	0.3188	0.3104	0.3356	0.3607	0.3775	0.3943	(22b)
Effective ac	0.5915	0.5880	0.5845	0.5681	0.5651	0.5508	0.5508	0.5482	0.5563	0.5651	0.5713	0.5777	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			7.9400	1.1450	9.0916			(27)
EXPOSED FLOOR			13.4100	0.1300	1.7433			(28b)
EXT floor			5.2800	0.1300	0.6864			(28a)
External Wall 1	61.0200	10.5800	50.4400	0.1800	9.0792			(29a)
Exposed Internal Wall	5.0000	2.2000	2.8000	0.1800	0.5040			(29a)
External Roof 1	61.0000		61.0000	0.1100	6.7100			(30)
Total net area of external elements Aum(A, m2)			145.7100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.6545			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.7000	0.0200	0.1140
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E20 Exposed floor (normal)	18.7500	0.3200	6.0000
P7 Party Wall - Exposed floor (normal)	7.8000	0.1600	1.2480
E24 Eaves (insulation at ceiling level - inverted)	5.9500	0.2400	1.4280
E14 Flat roof	5.7000	0.0800	0.4560
E10 Eaves (insulation at ceiling level)	10.7000	0.0600	0.6420
E12 Gable (insulation at ceiling level)	6.2000	0.0600	0.3720
E2 Other lintels (including other steel lintels)	7.3000	0.0500	0.3650
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	30.8000	0.0500	1.5400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4730 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.1275 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9640	26.8020	26.6432	25.8973	25.7577	25.1081	25.1081	24.9878	25.3583	25.7577	26.0400	26.3352	(38)
Heat transfer coeff	73.0915	72.9295	72.7707	72.0248	71.8852	71.2356	71.2356	71.1153	71.4858	71.8852	72.1675	72.4627	(39)
Average = Sum(39)m / 12 =												72.0241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4287	1.4255	1.4224	1.4078	1.4051	1.3924	1.3924	1.3901	1.3973	1.4051	1.4106	1.4164	(40)
HLP (average)												1.4078	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7243 (42)
Hot water usage for mixer showers

53.1302	52.3317	51.1682	48.9421	47.2993	45.4672	44.4259	45.5806	46.8463	48.8134	51.0873	52.9266	(42a)

Hot water usage for baths

22.9709	22.6298	22.1494	21.2636	20.6003	19.8649	19.4676	19.9446	20.4641	21.2510	22.1551	22.8933	(42b)

Hot water usage for other uses

32.2885	31.1143	29.9402	28.7661	27.5920	26.4178	26.4178	27.5920	28.7661	29.9402	31.1143	32.2885	(42c)

Average daily hot water use (litres/day) 99.6351 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.3896	106.0758	103.2578	98.9718	95.4916	91.7499	90.3113	93.1172	96.0765	100.0046	104.3567	108.1083	(44)
Energy conte	171.6626	151.0506	158.7034	135.4874	128.5500	112.8172	109.2237	115.2985	118.4719	135.7053	148.6753	169.2715	(45)
Energy content (annual)											Total = Sum(45)m =	1654.9174	
Distribution loss (46)m = 0.15 x (45)m	25.7494	22.6576	23.8055	20.3231	19.2825	16.9226	16.3836	17.2948	17.7708	20.3558	22.3013	25.3907	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	218.2575	193.1363	205.2983	180.5793	175.1449	157.9091	155.8186	161.8934	163.5637	182.3002	193.7671	215.8664	(62)
WWHRS	-24.2889	-21.4813	-22.4940	-18.6259	-17.3587	-14.8539	-13.9232	-14.8059	-15.3685	-18.1177	-20.5252	-23.8391	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	193.9686	171.6550	182.8043	161.9534	157.7862	143.0551	141.8954	147.0875	148.1953	164.1825	173.2420	192.0273	(64)
										Total per year (kWh/year) = Sum(64)m =		1977.8526	(64)
12Total per year (kWh/year)												1978	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.3537	83.8929	90.0448	81.1230	80.0188	73.5852	73.5928	75.6127	75.4654	82.3979	85.5080	93.5587	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	86.2145	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	79.5464	88.0693	79.5464	82.1980	79.5464	82.1980	79.5464	79.5464	82.1980	79.5464	82.1980	79.5464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	150.2462	151.8053	147.8764	139.5124	128.9543	119.0311	112.4019	110.8428	114.7716	123.1357	133.6938	143.6169	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	31.6214	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	-68.9716	(71)
Water heating gains (Table 5)													
	126.8195	124.8406	121.0280	112.6709	107.5521	102.2017	98.9151	101.6299	104.8130	110.7499	118.7611	125.7510	(72)
Total internal gains													
	408.4765	416.5795	400.3152	386.2456	367.9172	352.2951	339.7277	340.8835	350.6470	365.2964	386.5172	400.7786	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.4000	11.2829	0.6300	0.7000	0.7700	4.8275	(75)
Southeast	4.3600	36.7938	0.6300	0.7000	0.7700	49.0268	(77)
Northwest	2.1800	11.2829	0.6300	0.7000	0.7700	7.5171	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	61.3714	108.6385	159.5353	215.9276	258.5197	263.9796	251.4544	218.5582	178.8877	123.0053	74.2555	52.0379	(83)
Total gains	469.8479	525.2180	559.8505	602.1731	626.4369	616.2747	591.1821	559.4417	529.5347	488.3017	460.7727	452.8166	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6073	48.7152	48.8216	49.3272	49.4229	49.8736	49.8736	49.9580	49.6991	49.4229	49.2296	49.0291	
alpha	4.2405	4.2477	4.2548	4.2885	4.2949	4.3249	4.3249	4.3305	4.3133	4.2949	4.2820	4.2686	
util living area													
	0.9892	0.9816	0.9672	0.9262	0.8365	0.6744	0.5136	0.5595	0.7819	0.9378	0.9803	0.9907	(86)
MIT	19.4927	19.6859	19.9745	20.3721	20.7107	20.9191	20.9803	20.9717	20.8412	20.4200	19.8970	19.4637	(87)
Th 2	19.7414	19.7438	19.7462	19.7573	19.7594	19.7692	19.7692	19.7710	19.7654	19.7594	19.7552	19.7508	(88)
util rest of house													
	0.9857	0.9756	0.9559	0.8999	0.7782	0.5698	0.3782	0.4222	0.6903	0.9099	0.9728	0.9877	(89)
MIT 2	18.0384	18.2841	18.6479	19.1407	19.5233	19.7252	19.7635	19.7619	19.6639	19.2093	18.5615	18.0081	(90)
Living area fraction										fLA = Living area / (4) =		0.4527	(91)
MIT	18.6968	18.9187	19.2484	19.6981	20.0608	20.2657	20.3144	20.3095	20.1969	19.7574	19.1660	18.6671	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6968	18.9187	19.2484	19.6981	20.0608	20.2657	20.3144	20.3095	20.1969	19.7574	19.1660	18.6671	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9704	0.9503	0.8984	0.7940	0.6144	0.4398	0.4846	0.7255	0.9099	0.9680	0.9840	(94)
Useful gains	461.2071	509.6631	532.0029	540.9812	497.3713	378.6487	260.0152	271.0908	384.1891	444.2948	446.0473	445.5832	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1052.2838	1022.3781	927.7130	777.7340	601.0214	403.5965	264.5957	278.0286	435.8383	658.2807	870.7771	1048.3220	(97)
Space heating kWh													
	439.7611	344.5445	294.4083	170.4620	77.1157	0.0000	0.0000	0.0000	0.0000	159.2055	305.8055	448.4377	(98a)
Space heating requirement - total per year (kWh/year)												2239.7403	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	439.7611	344.5445	294.4083	170.4620	77.1157	0.0000	0.0000	0.0000	0.0000	159.2055	305.8055	448.4377	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2239.7403	
Space heating per m2											(98c) / (4) =	43.7791	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	439.7611	344.5445	294.4083	170.4620	77.1157	0.0000	0.0000	0.0000	0.0000	159.2055	305.8055	448.4377	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	476.4476	373.2876	318.9689	184.6825	83.5490	0.0000	0.0000	0.0000	0.0000	172.4870	331.3169	485.8480	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating
Water heating requirement

	193.9686	171.6550	182.8043	161.9534	157.7862	143.0551	141.8954	147.0875	148.1953	164.1825	173.2420	192.0273 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.8369	85.5900	85.1225	84.1748	82.5465	79.8000	79.8000	79.8000	79.8000	83.9908	85.3201	85.8955 (217)
Fuel for water heating, kWh/month												
	225.9733	200.5549	214.7546	192.4012	191.1482	179.2671	177.8138	184.3201	185.7083	195.4768	203.0494	223.5594 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.5282	13.2595	11.9387	8.7468	6.7563	5.5200	6.1633	8.0113	10.4059	13.6531	15.4212	16.9875 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-17.6135	-25.7438	-38.3570	-44.7735	-49.7375	-46.9887	-46.4474	-43.1468	-37.5393	-30.1996	-19.6975	-15.1258 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.3559	-15.7136	-31.6707	-48.2018	-64.3381	-64.8356	-64.0392	-53.9170	-39.1425	-22.6432	-9.8791	-5.7966 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	2426.5875	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2374.0272	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	133.3918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-842.9037	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4177.1028	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2426.5875	0.2100	509.5834	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2374.0272	0.2100	498.5457	(264)
Space and water heating			1008.1291	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.3918	0.1443	19.2526	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-415.3703	0.1338	-55.5801	
PV Unit electricity exported	-427.5334	0.1255	-53.6646	
Total			-109.2447	(269)
Total CO2, kg/year			930.0662	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.1800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2426.5875	1.1300	2742.0439	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2374.0272	1.1300	2682.6507	(278)
Space and water heating			5424.6946	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.3918	1.5338	204.6009	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-415.3703	1.4945	-620.7666	
PV Unit electricity exported	-427.5334	0.4607	-196.9789	
Total			-817.7455	(283)
Total Primary energy kWh/year			4941.6507	(286)
Target Primary Energy Rate (TPER)			96.5900	(287)

Full SAP Calculation Printout

Property Reference	FLAT 15	**Issued on Date**	17/06/2025
Assessment Reference	Flat 15	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	2.13	**TER**	15.91
Environmental	99 A	**% DER < TER**			86.61
CO_2 Emissions (t/year)	0.09	**DFEE**	44.76	**TFEE**	42.06
Compliance Check	See BREL	**% DFEE < TFEE**			-6.41
% DPER < TPER	74.82	**DPER**	21.25	**TPER**	84.39

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	136.5660	(5)

---

2. Ventilation rate

---

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			9.9000	0.8687	8.6004			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
Doors			1.5400	0.9000	1.3860			(26)
External Wall 1	52.2900	14.0800	38.2100	0.1200	4.5852			(29a)
Exposed Internal Wall	11.7000		11.7000	0.1200	1.4040			(29a)
External Roof 1	50.5900		50.5900	0.1000	5.0590			(30)
Total net area of external elements Aum(A, m2)			114.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4106			(33)
Main dwelling								
Party Wall 1			18.6300	0.0000	0.0000			(32)
Party Floor 1			50.5800					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	18.1000	0.0700	1.2670	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.6000	0.0800	0.4480	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000	
E25 Staggered party wall between dwellings	2.7000	0.0800	0.2160	
E16 Corner (normal)	8.1000	0.0900	0.7290	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E14 Flat roof	5.6000	0.0800	0.4480	
E10 Eaves (insulation at ceiling level)	8.7000	0.1200	1.0440	
E12 Gable (insulation at ceiling level)	9.4000	0.4800	4.5120	
P4 Party wall - Roof (insulation at ceiling level)	6.9000	0.2400	1.6560	
E2 Other lintels (including other steel lintels)	7.2000	0.2000	1.4400	
E3 Sill	4.9000	0.0400	0.1960	
E4 Jamb	27.6000	0.0500	1.3800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.0930 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.5036 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9144	12.7708	12.6271	11.9089	11.7652	11.0470	11.0470	10.9033	11.3343	11.7652	12.0525	12.3398	(38)
Heat transfer coeff	49.4180	49.2744	49.1307	48.4125	48.2688	47.5506	47.5506	47.4069	47.8379	48.2688	48.5561	48.8434	(39)

Average = Sum(39)m / 12 = 48.3766

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9770	0.9742	0.9713	0.9571	0.9543	0.9401	0.9401	0.9373	0.9458	0.9543	0.9600	0.9657	(40)
HLP (average)												0.9564	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)
Hot water usage for baths	22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)
Hot water usage for other uses	32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(64)
									Total per year (kWh/year) = Sum(64)m =			2762.5671	(64)
12Total per year (kWh/year)												2763	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	100.6557	89.5922	96.3701	87.2767	86.3982	55.3188	54.7307	56.7397	57.1888	88.7645	91.6380	99.8650	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.7321	83.8463	75.7321	78.2566	75.7321	78.2566	75.7321	75.7321	78.2566	75.7321	78.2566	75.7321	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	135.2899	133.3217	129.5297	121.2177	116.1266	76.8317	73.5628	76.2630	79.4289	119.3071	127.2750	134.2271	(72)
Total internal gains	408.3701	416.0595	400.2639	386.1961	368.1283	321.5341	309.1780	310.3348	319.9145	365.5485	386.4932	400.7445	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.5400	36.7938	0.3000	0.8000	0.7700	9.4241	(77)
Southwest	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(79)

Northwest			6.1600		11.2829		0.3000		0.8000		0.7700		11.5597 (81)
Solar gains	34.4468	62.5154	95.7351	135.7153	167.6159	173.2672	164.1918	139.3433	109.4149	71.8427	41.9586	29.0269 (83)	
Total gains	442.8170	478.5749	495.9990	521.9114	535.7442	494.8013	473.3698	449.6781	429.3295	437.3912	428.4518	429.7714 (84)	

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.0773	71.2845	71.4929	72.5536	72.7695	73.8687	73.8687	74.0925	73.4251	72.7695	72.3390	71.9135	
alpha	5.7385	5.7523	5.7662	5.8369	5.8513	5.9246	5.9246	5.9395	5.8950	5.8513	5.8226	5.7942	
util living area	0.9868	0.9776	0.9588	0.8982	0.7692	0.6013	0.4400	0.4815	0.7237	0.9059	0.9729	0.9886	(86)
Living	20.1502	20.2874	20.4812	20.7430	20.9191	20.9850	20.9980	20.9966	20.9574	20.7676	20.4334	20.1323	
Non living	19.1319	19.3058	19.5481	19.8684	20.0568	20.1252	20.1329	20.1347	20.1014	19.9039	19.4998	19.1166	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5653	20.2874	20.4812	20.7430	20.9191	20.9850	20.9980	20.9966	20.9574	20.7676	20.4334	20.2536	(87)
Th 2	20.1025	20.1049	20.1073	20.1192	20.1216	20.1335	20.1335	20.1359	20.1288	20.1216	20.1168	20.1120	(88)
util rest of house	0.9829	0.9712	0.9468	0.8702	0.7159	0.5258	0.3545	0.3929	0.6492	0.8743	0.9640	0.9853	(89)
MIT 2	19.7156	19.3058	19.5481	19.8684	20.0568	20.1252	20.1329	20.1347	20.1014	19.9039	19.4998	19.2960	(90)
Living area fraction										fLA = Living area / (4) =		0.5042	(91)
MIT	20.1440	19.8007	20.0185	20.3093	20.4915	20.5587	20.5690	20.5693	20.5329	20.3393	19.9705	19.7788	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1440	19.8007	20.0185	20.3093	20.4915	20.5587	20.5690	20.5693	20.5329	20.3393	19.9705	19.7788	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9831	0.9686	0.9454	0.8768	0.7393	0.5634	0.3977	0.4377	0.6851	0.8830	0.9622	0.9838	(94)
Useful gains	435.3495	463.5305	468.9195	457.6090	396.0706	278.7890	188.2393	196.8092	294.1265	386.2077	412.2616	422.7985	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	782.9773	734.2216	664.1739	552.3533	424.3578	283.3373	188.7287	197.6515	307.7379	470.1069	624.9401	760.9216	(97)
Space heating kWh	258.6351	181.9044	145.2693	68.2159	21.0456	0.0000	0.0000	0.0000	0.0000	62.4210	153.1285	251.5635	(98a)
Space heating requirement - total per year (kWh/year)												1142.1833	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	258.6351	181.9044	145.2693	68.2159	21.0456	0.0000	0.0000	0.0000	0.0000	62.4210	153.1285	251.5635	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1142.1833	
Space heating per m2										(98c) / (4) =		22.5817	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	284.2333 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	258.6351	181.9044	145.2693	68.2159	21.0456	0.0000	0.0000	0.0000	0.0000	62.4210	153.1285	251.5635	(98)
Space heating efficiency (main heating system 1)	284.2333	284.2333	284.2333	284.2333	284.2333	0.0000	0.0000	0.0000	0.0000	284.2333	284.2333	284.2333	(210)
Space heating fuel (main heating system)	90.9939	63.9983	51.1092	24.0000	7.4044	0.0000	0.0000	0.0000	0.0000	21.9612	53.8742	88.5060	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(64)
Efficiency of water heater												288.6567	(216)
(217)m	288.6567	288.6567	288.6567	288.6567	288.6567	288.6567	288.6567	288.6567	288.6567	288.6567	288.6567	288.6567	(217)
Fuel for water heating, kWh/month	95.6602	85.0247	91.1950	82.0178	80.8053	63.6140	63.2006	65.2937	65.5624	83.2707	86.5619	94.8363	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5186	7.6942	8.5186	8.2438	8.5186	8.2438	8.5186	8.5186	8.2438	8.5186	8.2438	8.5186	(231)
Lighting	15.7356	12.6237	11.3663	8.3274	6.4323	5.2553	5.8678	7.6272	9.9069	12.9984	14.6817	16.1730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.3716	-62.3306	-90.8254	-100.0966	-105.0522	-93.7360	-92.6594	-88.3162	-78.9849	-69.5266	-47.4943	-37.1879	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												401.8471	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.6567	
Water heating fuel used	957.0426	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	100.2995	(230a)
Total electricity for the above, kWh/year	100.2995	(231)
Electricity for lighting (calculated in Appendix L)	126.9957	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-909.5817	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	676.6032	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	401.8471	0.1564	62.8490	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	957.0426	0.1414	135.3587	(264)
Space and water heating			198.2077	(265)
Pumps, fans and electric keep-hot	100.2995	0.1387	13.9128	(267)
Energy for lighting	126.9957	0.1443	18.3294	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-909.5817	0.1351	-122.8694	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-122.8694	(269)
Total CO2, kg/year			107.5804	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.1300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	401.8471	1.5790	634.5203	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	957.0426	1.5230	1457.5910	(278)
Space and water heating			2092.1112	(279)
Pumps, fans and electric keep-hot	100.2995	1.5128	151.7331	(281)
Energy for lighting	126.9957	1.5338	194.7902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-909.5817	1.4993	-1363.7254	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1363.7254	(283)
Total Primary energy kWh/year			1074.9092	(286)
Dwelling Primary energy Rate (DPER)			21.2500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.5660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1464	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3964	(18)
Number of sides sheltered	2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3370 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4297	0.4212	0.4128	0.3707	0.3623	0.3201	0.3201	0.3117	0.3370	0.3623	0.3791	0.3960	(22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5568	0.5656	0.5719	0.5784	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1800	1.0000	4.1800			(26)
TER Opening Type			8.4700	1.1450	9.6985			(27)
External Wall 1	52.2900	12.6500	39.6400	0.1800	7.1352			(29a)
Exposed Internal Wall	11.7000		11.7000	0.1800	2.1060			(29a)
External Roof 1	50.5900		50.5900	0.1100	5.5649			(30)
Total net area of external elements Aum(A, m2)			114.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.6846			(33)
Main dwelling								
Party Wall 1			18.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	18.1000	0.0700	1.2670
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.6000	0.0200	0.1120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000
E25 Staggered party wall between dwellings	2.7000	0.0600	0.1620
E16 Corner (normal)	8.1000	0.0900	0.7290
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E14 Flat roof	5.6000	0.0800	0.4480
E10 Eaves (insulation at ceiling level)	8.7000	0.0600	0.5220
E12 Gable (insulation at ceiling level)	9.4000	0.0600	0.5640
P4 Party wall - Roof (insulation at ceiling level)	6.9000	0.1200	0.8280
E2 Other lintels (including other steel lintels)	7.2000	0.0500	0.3600
E3 Sill	4.9000	0.0500	0.2450
E4 Jamb	27.6000	0.0500	1.3800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3740 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.0586 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.6931	26.5315	26.3732	25.6296	25.4904	24.8427	24.8427	24.7228	25.0922	25.4904	25.7719	26.0662	(38)
Heat transfer coeff	61.7516	61.5901	61.4318	60.6881	60.5490	59.9013	59.9013	59.7814	60.1508	60.5490	60.8305	61.1247	(39)
Average = Sum(39)m / 12 =												60.6875	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2209	1.2177	1.2145	1.1998	1.1971	1.1843	1.1843	1.1819	1.1892	1.1971	1.2027	1.2085	(40)
HLP (average)												1.1998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)
Hot water usage for baths	22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)
Hot water usage for other uses	32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)
Average daily hot water use (litres/day)												99.0971	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	217.3306	192.3208	204.4415	179.8478	174.4509	157.3000	155.2289	161.2709	162.9241	181.5675	192.9644	214.9525	(62)
WWHRS	-24.1578	-21.3654	-22.3726	-18.5254	-17.2650	-14.7738	-13.8481	-14.7260	-15.2855	-18.0199	-20.4144	-23.7104	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	193.1728	170.9554	182.0689	161.3224	157.1859	142.5262	141.3809	146.5449	147.6386	163.5476	172.5500	191.2421	(64)
									Total per year (kWh/year) = Sum(64)m =			1970.1357	(64)
12Total per year (kWh/year)												1970	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	94.0456	83.6217	89.7599	80.8798	79.7880	73.3827	73.3967	75.4057	75.2527	82.1543	85.2411	93.2548	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.5893	85.9024	77.5893	80.1756	77.5893	80.1756	77.5893	77.5893	80.1756	77.5893	80.1756	77.5893	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)													
	126.4053	124.4371	120.6450	112.3331	107.2420	101.9204	98.6515	101.3517	104.5176	110.4225	118.3904	125.3425	(72)
Total internal gains													
	404.3426	412.2310	396.2364	382.2305	364.1008	348.5418	336.1239	337.2806	346.9223	361.5210	382.5276	396.7170	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(77)
Southwest	1.8800	36.7938	0.6300	0.7000	0.7700	21.1400	(79)
Northwest	5.2700	11.2829	0.6300	0.7000	0.7700	18.1721	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	54.1550	98.2821	150.5066	213.3584	263.5080	272.3918	258.1247	219.0614	172.0122	112.9455	65.9645	45.6342	(83)
Total gains	458.4977	510.5131	546.7430	595.5889	627.6088	620.9337	594.2486	556.3420	518.9345	474.4665	448.4920	442.3512	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.8811	57.0303	57.1772	57.8779	58.0109	58.6381	58.6381	58.7558	58.3949	58.0109	57.7424	57.4645	
alpha	4.7921	4.8020	4.8118	4.8585	4.8674	4.9092	4.9092	4.9171	4.8930	4.8674	4.8495	4.8310	
util living area													
	0.9885	0.9796	0.9608	0.9034	0.7817	0.5939	0.4389	0.4863	0.7265	0.9233	0.9778	0.9902	(86)
MIT	19.7905	19.9710	20.2345	20.5877	20.8476	20.9693	20.9942	20.9907	20.9199	20.5973	20.1456	19.7651	(87)
Th 2	19.9033	19.9059	19.9084	19.9201	19.9223	19.9326	19.9326	19.9345	19.9286	19.9223	19.9179	19.9132	(88)
util rest of house													
	0.9849	0.9733	0.9484	0.8736	0.7218	0.5047	0.3349	0.3778	0.6399	0.8929	0.9697	0.9871	(89)
MIT 2	18.5288	18.7578	19.0882	19.5199	19.8014	19.9162	19.9309	19.9314	19.8786	19.5426	18.9891	18.5037	(90)
Living area fraction									fLA = Living area / (4) =			0.5042	(91)
MIT	19.1649	19.3694	19.6661	20.0582	20.3288	20.4471	20.4670	20.4655	20.4036	20.0743	19.5721	19.1396	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1649	19.3694	19.6661	20.0582	20.3288	20.4471	20.4670	20.4655	20.4036	20.0743	19.5721	19.1396	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9817	0.9694	0.9451	0.8779	0.7458	0.5488	0.3875	0.4326	0.6804	0.8978	0.9665	0.9842	(94)
Useful gains	450.1044	494.8747	516.7450	522.8394	468.0567	340.7433	230.2465	240.6893	353.0651	425.9902	433.4714	435.3733	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	917.9315	891.1743	808.8168	677.1731	522.4670	350.2500	231.6374	243.0392	379.1654	573.6610	758.6858	913.1817	(97)
Space heating kWh													
	348.0634	266.3133	217.3014	111.1202	40.4813	0.0000	0.0000	0.0000	0.0000	109.8671	234.1544	355.4894	(98a)
Space heating requirement - total per year (kWh/year)												1682.7905	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	348.0634	266.3133	217.3014	111.1202	40.4813	0.0000	0.0000	0.0000	0.0000	109.8671	234.1544	355.4894	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1682.7905	
Space heating per m2											(98c) / (4) =	33.2699	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	348.0634	266.3133	217.3014	111.1202	40.4813	0.0000	0.0000	0.0000	0.0000	109.8671	234.1544	355.4894	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	377.1001	288.5302	235.4295	120.3903	43.8584	0.0000	0.0000	0.0000	0.0000	119.0326	253.6884	385.1457	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	193.1728	170.9554	182.0689	161.3224	157.1859	142.5262	141.3809	146.5449	147.6386	163.5476	172.5500	191.2421	(64)

Efficiency of water heater											79.8000	(216)
(217)m	85.3638	85.0499	84.4575	83.2410	81.4915	79.8000	79.8000	79.8000	79.8000	83.1879	84.7450	85.4298 (217)
Fuel for water heating, kWh/month												
	226.2935	201.0061	215.5746	193.8016	192.8863	178.6043	177.1690	183.6402	185.0107	196.6001	203.6108	223.8588 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.1215	12.9333	11.6450	8.5316	6.5901	5.3841	6.0117	7.8142	10.1499	13.3172	15.0417	16.5696 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-17.4172	-25.4595	-37.9386	-44.2931	-49.2126	-46.4973	-45.9613	-42.6897	-37.1346	-29.8682	-19.4786	-14.9569 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.2691	-15.5280	-31.2951	-47.6281	-63.5698	-64.0593	-63.2727	-53.2737	-38.6778	-22.3755	-9.7626	-5.7283 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1823.1749	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2378.0561	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.1099	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-833.3478	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3583.9931	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1823.1749	0.2100	382.8667	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2378.0561	0.2100	499.3918	(264)
Space and water heating			882.2585	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.1099	0.1443	18.7789	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-410.9076	0.1338	-54.9815	
PV Unit electricity exported	-422.4402	0.1255	-53.0259	
Total			-108.0074	(269)
Total CO2, kg/year			804.9593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.9100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1823.1749	1.1300	2060.1877	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2378.0561	1.1300	2687.2034	(278)
Space and water heating			4747.3911	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.1099	1.5338	199.5669	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-410.9076	1.4945	-614.0916	
PV Unit electricity exported	-422.4402	0.4607	-194.6345	
Total			-808.7261	(283)
Total Primary energy kWh/year			4268.3326	(286)
Target Primary Energy Rate (TPER)			84.3900	(287)

Full SAP Calculation Printout

Property Reference	FLAT 16	**Issued on Date**	17/06/2025
Assessment Reference	Flat 16	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	1.72	**TER**	13.01
Environmental	99 A	**% DER < TER**			86.78
CO_2 Emissions (t/year)	0.11	**DFEE**	38.44	**TFEE**	38.43
Compliance Check	See BREL	**% DFEE < TFEE**			-0.02
% DPER < TPER	74.82	**DPER**	17.25	**TPER**	68.49

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.6000 (1b)	x	2.7000 (2b)	=	209.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.5200	(5)

---

2. Ventilation rate

---

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			15.4000	0.8687	13.3784			(27)
OPAQUE			5.2800	0.9000	4.7520			(26)
Door			2.2000	0.9000	1.9800			(26)
External Wall 1	58.0000	20.6800	37.3200	0.1200	4.4784			(29a)
Exposed Internal Wall	11.4800	2.2000	9.2800	0.1200	1.1136			(29a)
External Roof 1	58.3000		58.3000	0.1000	5.8300			(30)
Flat roof	19.4000		19.4000	0.1000	1.9400			(30)
Total net area of external elements Aum(A, m2)			147.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.4724			(33)
Main dwelling								
Party Wall 1			18.6100	0.0000	0.0000			(32)
Party Floor 1			77.6900					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	13.5500	0.0700	0.9485
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.9300	0.0800	0.6344
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.1000	0.0000	0.0000
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	8.1000	-0.0900	-0.7290
E14 Flat roof	12.3700	0.0800	0.9896
E10 Eaves (insulation at ceiling level)	8.7000	0.1200	1.0440
E12 Gable (insulation at ceiling level)	1.4300	0.4800	0.6864
P4 Party wall - Roof (insulation at ceiling level)	6.8900	0.2400	1.6536
E24 Eaves (insulation at ceiling level - inverted)	6.2100	0.2400	1.4904
E2 Other lintels (including other steel lintels)	10.4000	0.2000	2.0800
E3 Sill	7.0000	0.0400	0.2800
E4 Jamb	44.0000	0.0500	2.2000
E18 Party wall between dwellings	5.4000	0.0600	0.3240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.0059 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.4783 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8134	19.5930	19.3726	18.2707	18.0503	16.9483	16.9483	16.7279	17.3891	18.0503	18.4911	18.9318	(38)
Heat transfer coeff	66.2917	66.0713	65.8509	64.7489	64.5286	63.4266	63.4266	63.2062	63.8674	64.5286	64.9693	65.4101	(39)

Average = Sum(39)m / 12 = 64.6938

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8543	0.8514	0.8486	0.8344	0.8316	0.8174	0.8174	0.8145	0.8230	0.8316	0.8372	0.8429	(40)
HLP (average)												0.8337	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4157 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	64.7238	63.7511	62.3338	59.6219	57.6206	55.3887	54.1201	55.5268	57.0687	59.4651	62.2352	64.4758	(42a)
Hot water usage for baths	27.9566	27.5414	26.9567	25.8787	25.0714	24.1763	23.6929	24.2734	24.9056	25.8634	26.9636	27.8621	(42b)
Hot water usage for other uses	39.3696	37.9380	36.5064	35.0748	33.6432	32.2115	32.2115	33.6432	35.0748	36.5064	37.9380	39.3696	(42c)

Average daily hot water use (litres/day) 121.3839 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.0500	129.2305	125.7969	120.5753	116.3351	111.7766	110.0245	113.4434	117.0491	121.8348	127.1368	131.7075	(44)
Energy conte	209.1350	184.0226	193.3451	165.0616	156.6095	137.4424	133.0651	140.4666	144.3333	165.3287	181.1297	206.2222	(45)
Energy content (annual)										Total = Sum(45)m =		2016.1616	
Distribution loss (46)m = 0.15 x (45)m	31.3702	27.6034	29.0018	24.7592	23.4914	20.6164	19.9598	21.0700	21.6500	24.7993	27.1695	30.9333	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	314.5288	279.2170	298.7389	267.0556	262.0033	208.8604	206.8637	214.2652	215.7513	270.7225	283.1237	311.6160	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	314.5288	279.2170	298.7389	267.0556	262.0033	208.8604	206.8637	214.2652	215.7513	270.7225	283.1237	311.6160	(64)
										Total per year (kWh/year) = Sum(64)m =		3132.7462	(64)
12Total per year (kWh/year)												3133	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	113.4235	100.8265	108.1733	97.3534	95.9587	63.7092	62.8541	65.3151	66.0004	98.8579	102.6960	112.4550	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9676	120.6427	108.9676	112.5998	108.9676	112.5998	108.9676	108.9676	112.5998	108.9676	112.5998	108.9676	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.3515	216.5758	210.9707	199.0380	183.9750	169.8180	160.3603	158.1360	163.7411	175.6738	190.7368	204.8938	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	(71)
Water heating gains (Table 5)	152.4509	150.0395	145.3942	135.2130	128.9768	88.4850	84.4813	87.7891	91.6672	132.8735	142.6334	151.1491	(72)
Total internal gains	535.0062	546.4942	524.5687	506.0870	481.1556	430.1390	413.0453	414.1288	427.2444	476.7511	505.2062	524.2467	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southwest				9.2400		36.7938		0.3000		0.8000		0.7700	56.5446 (79)
Northwest				6.1600		11.2829		0.3000		0.8000		0.7700	11.5597 (81)
Solar gains	68.1044	119.8466	174.1782	232.9101	276.4821	281.3462	268.3915	234.8355	194.3522	135.2059	82.2726	57.8307 (83)	
Total gains	603.1106	666.3408	698.7469	738.9971	757.6377	711.4852	681.4368	648.9643	621.5966	611.9570	587.4788	582.0774 (84)	

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	81.2906	81.5617	81.8347	83.2274	83.5117	84.9626	84.9626	85.2588	84.3762	83.5117	82.9451	82.3862	
alpha	6.4194	6.4374	6.4556	6.5485	6.5674	6.6642	6.6642	6.6839	6.6251	6.5674	6.5297	6.4924	
util living area	0.9907	0.9810	0.9604	0.8915	0.7491	0.5646	0.4089	0.4469	0.6862	0.9043	0.9780	0.9923	(86)
Living	20.2560	20.4010	20.5853	20.8173	20.9522	20.9938	20.9994	20.9989	20.9792	20.8274	20.5188	20.2372	
Non living	19.3473	19.5316	19.7620	20.0456	20.1880	20.2349	20.2381	20.2404	20.2202	20.0639	19.6909	19.3313	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6194	20.4010	20.5853	20.8173	20.9522	20.9938	20.9994	20.9989	20.9792	20.8274	20.5188	20.3439	(87)
Th 2	20.2065	20.2090	20.2114	20.2236	20.2261	20.2383	20.2383	20.2408	20.2334	20.2261	20.2212	20.2163	(88)
util rest of house	0.9880	0.9757	0.9493	0.8641	0.6995	0.5001	0.3385	0.3737	0.6189	0.8742	0.9709	0.9901	(89)
MIT 2	19.8640	19.5316	19.7620	20.0456	20.1880	20.2349	20.2381	20.2404	20.2202	20.0639	19.6909	19.4908	(90)
Living area fraction										fLA = Living area / (4) =		0.4086	(91)
MIT	20.1727	19.8869	20.0984	20.3609	20.5003	20.5450	20.5492	20.5503	20.5304	20.3759	20.0292	19.8394	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1727	19.8869	20.0984	20.3609	20.5003	20.5450	20.5492	20.5503	20.5304	20.3759	20.0292	19.8394	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9878	0.9730	0.9474	0.8693	0.7177	0.5263	0.3673	0.4037	0.6457	0.8807	0.9688	0.9888	(94)
Useful gains	595.7645	648.3786	662.0193	642.4283	543.7337	374.4757	250.2823	261.9594	401.3481	538.9229	569.1352	575.5316	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1052.2259	990.2010	895.4684	742.0842	567.8707	377.0717	250.4834	262.3267	410.6901	630.8257	840.0036	1022.9767	(97)
Space heating kWh	339.6073	229.7046	173.6861	71.7523	17.9579	0.0000	0.0000	0.0000	0.0000	68.3757	195.0252	332.8991	(98a)
Space heating requirement - total per year (kWh/year)												1429.0082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	339.6073	229.7046	173.6861	71.7523	17.9579	0.0000	0.0000	0.0000	0.0000	68.3757	195.0252	332.8991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1429.0082	
Space heating per m2											(98c) / (4) =	18.4151	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												316.6451	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	339.6073	229.7046	173.6861	71.7523	17.9579	0.0000	0.0000	0.0000	0.0000	68.3757	195.0252	332.8991	(98)
Space heating efficiency (main heating system 1)	316.6451	316.6451	316.6451	316.6451	316.6451	0.0000	0.0000	0.0000	0.0000	316.6451	316.6451	316.6451	(210)
Space heating fuel (main heating system)	107.2517	72.5432	54.8520	22.6601	5.6713	0.0000	0.0000	0.0000	0.0000	21.5938	61.5911	105.1332	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	314.5288	279.2170	298.7389	267.0556	262.0033	208.8604	206.8637	214.2652	215.7513	270.7225	283.1237	311.6160	(64)
Efficiency of water heater												288.6156	(216)
(217)m	288.6156	288.6156	288.6156	288.6156	288.6156	288.6156	288.6156	288.6156	288.6156	288.6156	288.6156	288.6156	(217)
Fuel for water heating, kWh/month	108.9784	96.7435	103.5075	92.5298	90.7793	72.3663	71.6745	74.2389	74.7538	93.8004	98.0972	107.9692	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.0692	11.8045	13.0692	12.6477	13.0692	12.6477	13.0692	13.0692	12.6477	13.0692	12.6477	13.0692	(231)
Lighting	22.6413	18.1637	16.3544	11.9819	9.2552	7.5616	8.4429	10.9744	14.2547	18.7029	21.1249	23.2706	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.6378	-67.0065	-99.8893	-113.2897	-122.1146	-111.6712	-110.2313	-103.6411	-90.8278	-76.1606	-50.5175	-38.9772	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	451.2964	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.6156	
Water heating fuel used	1085.4388	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	153.8799	(230a)
Total electricity for the above, kWh/year	153.8799	(231)
Electricity for lighting (calculated in Appendix L)	182.7284	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1029.9647	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	843.3788	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	451.2964	0.1570	70.8440	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1085.4388	0.1415	153.5368	(264)
Space and water heating			224.3808	(265)
Pumps, fans and electric keep-hot	153.8799	0.1387	21.3450	(267)
Energy for lighting	182.7284	0.1443	26.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1029.9647	0.1344	-138.4269	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-138.4269	(269)
Total CO2, kg/year			133.6723	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	451.2964	1.5811	713.5593	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1085.4388	1.5231	1653.2076	(278)
Space and water heating			2366.7669	(279)
Pumps, fans and electric keep-hot	153.8799	1.5128	232.7895	(281)
Energy for lighting	182.7284	1.5338	280.2749	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1029.9647	1.4967	-1541.5673	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1541.5673	(283)
Total Primary energy kWh/year			1338.2640	(286)
Dwelling Primary energy Rate (DPER)			17.2500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.6000	(1b) x	2.7000	(2b) =	209.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		209.5200	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1432	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3932	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3342 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3091	0.3342	0.3593	0.3760	0.3927	(22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5558	0.5645	0.5707	0.5771	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			7.4800	1.0000	7.4800			(26)
TER Opening Type			11.9200	1.1450	13.6489			(27)
External Wall 1	58.0000	17.2000	40.8000	0.1800	7.3440			(29a)
Exposed Internal Wall	11.4800	2.2000	9.2800	0.1800	1.6704			(29a)
External Roof 1	58.3000		58.3000	0.1100	6.4130			(30)
Flat roof	19.4000		19.4000	0.1100	2.1340			(30)
Total net area of external elements Aum(A, m2)			147.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6903			(33)
Main dwelling								
Party Wall 1			18.6100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	13.5500	0.0700	0.9485
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.9300	0.0200	0.1586
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.1000	0.0000	0.0000
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	8.1000	-0.0900	-0.7290
E14 Flat roof	12.3700	0.0800	0.9896
E10 Eaves (insulation at ceiling level)	8.7000	0.0600	0.5220
E12 Gable (insulation at ceiling level)	1.4300	0.0600	0.0858
P4 Party wall - Roof (insulation at ceiling level)	6.8900	0.1200	0.8268
E24 Eaves (insulation at ceiling level - inverted)	6.2100	0.2400	1.4904
E2 Other lintels (including other steel lintels)	10.4000	0.0500	0.5200
E3 Sill	7.0000	0.0500	0.3500
E4 Jamb	44.0000	0.0500	2.2000
E18 Party wall between dwellings	5.4000	0.0600	0.3240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9827 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.6730 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8479	40.6042	40.3652	39.2430	39.0331	38.0557	38.0557	37.8747	38.4322	39.0331	39.4578	39.9019	(38)
Heat transfer coeff	88.5209	88.2771	88.0382	86.9160	86.7060	85.7286	85.7286	85.5476	86.1051	86.7060	87.1308	87.5748	(39)
Average = Sum(39)m / 12 =												86.9150	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1407	1.1376	1.1345	1.1201	1.1173	1.1048	1.1048	1.1024	1.1096	1.1173	1.1228	1.1285	(40)
HLP (average)												1.1200	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4157 (42)
Hot water usage for mixer showers

64.7238	63.7511	62.3338	59.6219	57.6206	55.3887	54.1201	55.5268	57.0687	59.4651	62.2352	64.4758	(42a)

Hot water usage for baths

27.9566	27.5414	26.9567	25.8787	25.0714	24.1763	23.6929	24.2734	24.9056	25.8634	26.9636	27.8621	(42b)

Hot water usage for other uses

39.3696	37.9380	36.5064	35.0748	33.6432	32.2115	32.2115	33.6432	35.0748	36.5064	37.9380	39.3696	(42c)

Average daily hot water use (litres/day) 121.3839 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.0500	129.2305	125.7969	120.5753	116.3351	111.7766	110.0245	113.4434	117.0491	121.8348	127.1368	131.7075	(44)
Energy conte	209.1350	184.0226	193.3451	165.0616	156.6095	137.4424	133.0651	140.4666	144.3333	165.3287	181.1297	206.2222	(45)
Energy content (annual)										Total = Sum(45)m =		2016.1616	
Distribution loss (46)m = 0.15 x (45)m	31.3702	27.6034	29.0018	24.7592	23.4914	20.6164	19.9598	21.0700	21.6500	24.7993	27.1695	30.9333	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	255.7299	226.1083	239.9400	210.1534	203.2044	182.5342	179.6600	187.0615	189.4251	211.9236	226.2216	252.8171	(62)
WWHRS	-29.5890	-26.1688	-27.4024	-22.6903	-21.1465	-18.0952	-16.9614	-18.0368	-18.7220	-22.0712	-25.0040	-29.0411	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.1408	199.9395	212.5376	187.4631	182.0578	164.4389	162.6986	169.0248	170.7031	189.8524	201.2176	223.7760	(64)
										Total per year (kWh/year) = Sum(64)m =		2289.8502	(64)
12Total per year (kWh/year)												2290	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	106.8133	94.8561	101.5632	90.9564	89.3486	81.7731	81.5201	83.9811	84.0643	92.2477	96.2991	105.8448 (65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	120.7873	(66)

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

	113.7260	125.9110	113.7260	117.5169	113.7260	117.5169	113.7260	113.7260	117.5169	113.7260	117.5169	113.7260	(67)

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

	214.3515	216.5758	210.9707	199.0380	183.9750	169.8180	160.3603	158.1360	163.7411	175.6738	190.7368	204.8938	(68)

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

	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	35.0787	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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

	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	-96.6298	(71)

Water heating gains (Table 5)

	143.5663	141.1549	136.5096	126.3284	120.0922	113.5737	109.5700	112.8778	116.7559	123.9889	133.7488	142.2645	(72)

Total internal gains

	533.8800	545.8779	523.4425	505.1194	480.0294	460.1448	442.8925	443.9760	457.2502	475.6249	504.2386	523.1205	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.1500	36.7938	0.6300	0.7000	0.7700	80.3994	(79)
Northwest	4.7700	11.2829	0.6300	0.7000	0.7700	16.4480	(81)

Solar gains	96.8474	170.4303	247.7018	331.2383	393.2161	400.1383	381.7119	333.9807	276.3959	192.2745	116.9958	82.2374	(83)
Total gains	630.7274	716.3081	771.1443	836.3577	873.2455	860.2830	824.6044	777.9567	733.6460	667.8994	621.2344	605.3579	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.8770	61.0451	61.2108	62.0011	62.1513	62.8599	62.8599	62.9928	62.5850	62.1513	61.8483	61.5347	
alpha	5.0585	5.0697	5.0807	5.1334	5.1434	5.1907	5.1907	5.1995	5.1723	5.1434	5.1232	5.1023	
util living area	0.9922	0.9844	0.9679	0.9163	0.8021	0.6139	0.4531	0.4985	0.7388	0.9342	0.9838	0.9936	(86)
MIT	19.8204	20.0085	20.2656	20.6037	20.8528	20.9714	20.9950	20.9921	20.9275	20.6140	20.1671	19.7938	(87)
Th 2	19.9677	19.9703	19.9727	19.9845	19.9867	19.9970	19.9970	19.9989	19.9930	19.9867	19.9822	19.9776	(88)
util rest of house	0.9898	0.9795	0.9577	0.8900	0.7462	0.5277	0.3521	0.3938	0.6563	0.9077	0.9778	0.9916	(89)
MIT 2	18.6136	18.8533	19.1770	19.5940	19.8675	19.9813	19.9954	19.9962	19.9467	19.6165	19.0649	18.5870	(90)
Living area fraction									fLA = Living area / (4) =			0.4086	(91)
MIT	19.1067	19.3253	19.6219	20.0066	20.2701	20.3859	20.4039	20.4031	20.3475	20.0241	19.5153	19.0801	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1067	19.3253	19.6219	20.0066	20.2701	20.3859	20.4039	20.4031	20.3475	20.0241	19.5153	19.0801	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9756	0.9534	0.8906	0.7630	0.5621	0.3935	0.4367	0.6872	0.9089	0.9743	0.9892	(94)
Useful gains	622.5401	698.8211	735.1737	744.8893	666.3145	483.5577	324.5010	339.7503	504.1285	607.0316	605.2708	598.8137	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1310.7046	1273.4254	1155.2252	965.3417	743.0806	496.0193	326.1039	342.4573	537.9416	817.1248	1081.7530	1303.1246	(97)
Space heating kWh	511.9944	386.1341	312.5183	158.7257	57.1140	0.0000	0.0000	0.0000	0.0000	156.3094	343.0672	524.0073	(98a)
Space heating requirement - total per year (kWh/year)												2449.8703	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	511.9944	386.1341	312.5183	158.7257	57.1140	0.0000	0.0000	0.0000	0.0000	156.3094	343.0672	524.0073	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2449.8703	
Space heating per m2											(98c) / (4) =	31.5705	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	511.9944	386.1341	312.5183	158.7257	57.1140	0.0000	0.0000	0.0000	0.0000	156.3094	343.0672	524.0073	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	554.7068	418.3468	338.5897	171.9671	61.8786	0.0000	0.0000	0.0000	0.0000	169.3493	371.6871	567.7219	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating
Water heating requirement

	226.1408	199.9395	212.5376	187.4631	182.0578	164.4389	162.6986	169.0248	170.7031	189.8524	201.2176	223.7760 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.8342	85.5099	84.9230	83.6889	81.7793	79.8000	79.8000	79.8000	79.8000	83.6272	85.2457	85.9008 (217)
Fuel for water heating, kWh/month												
	263.4624	233.8202	250.2709	223.9998	222.6210	206.0638	203.8830	211.8105	213.9136	227.0223	236.0442	260.5051 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	23.6300	18.9569	17.0686	12.5052	9.6594	7.8918	8.8116	11.4536	14.8771	19.5196	22.0473	24.2868 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-26.2841	-38.1880	-56.5463	-65.5541	-72.3891	-68.1806	-67.3448	-62.7427	-54.8997	-44.5515	-29.2965	-22.5938 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-11.5898	-24.6950	-49.6724	-75.4717	-100.6420	-101.4357	-100.2424	-84.4847	-61.4119	-35.6010	-15.5655	-9.1415 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	2654.2474 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2753.4168 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	190.7078 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1278.5248 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4405.8472 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2654.2474	0.2100	557.3919	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2753.4168	0.2100	578.2175	(264)
Space and water heating			1135.6095	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	190.7078	0.1443	27.5250	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-608.5711	0.1340	-81.5230	
PV Unit electricity exported	-669.9537	0.1256	-84.1176	
Total			-165.6406	(269)
Total CO2, kg/year			1009.4232	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2654.2474	1.1300	2999.2995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2753.4168	1.1300	3111.3610	(278)
Space and water heating			6110.6605	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	190.7078	1.5338	292.5140	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-608.5711	1.4951	-909.8447	
PV Unit electricity exported	-669.9537	0.4609	-308.7586	
Total			-1218.6033	(283)
Total Primary energy kWh/year			5314.6720	(286)
Target Primary Energy Rate (TPER)			68.4900	(287)

Full SAP Calculation Printout

Property Reference	FLAT 17	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 17	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	1.90	**TER**	14.25
Environmental	99 A	**% DER < TER**			86.67
CO_2 Emissions (t/year)	0.08	**DFEE**	39.64	**TFEE**	35.12
Compliance Check	See BREL	**% DFEE < TFEE**			-12.87
% DPER < TPER	74.86	**DPER**	18.96	**TPER**	75.42

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	34.2500	11.0000	23.2500	0.1200	2.7900			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1200	2.1984			(29a)
External Roof 1	52.4000		52.4000	0.1000	5.2400			(30)
Total net area of external elements Aum(A, m2)			107.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.8469			(33)
Main dwelling								
Party Wall 1			28.3900	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0700	0.8750	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9000	0.0800	0.4720	
E16 Corner (normal)	6.2200	0.0900	0.5598	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	4.5800	0.0800	0.3664	
E18 Party wall between dwellings	4.5800	0.0600	0.2748	
E14 Flat roof	5.9000	0.0800	0.4720	
E12 Gable (insulation at ceiling level)	10.9000	0.4800	5.2320	
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.2400	1.4880	
E10 Eaves (insulation at ceiling level)	7.8000	0.1200	0.9360	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.1050 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.9519 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	47.6614	47.5257	47.3900	46.7116	46.5759	45.8975	45.8975	45.7618	46.1688	46.5759	46.8473	47.1187	(39)

Average = Sum(39)m / 12 = 46.6777

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9096	0.9070	0.9044	0.8914	0.8889	0.8759	0.8759	0.8733	0.8811	0.8889	0.8940	0.8992	(40)
HLP (average)												0.8908	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)

Energy content (annual) Total = Sum(45)m = 1674.0285

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

26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)

Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(64)

Total per year (kWh/year) = Sum(64)m = 2790.6131 (64)

12Total per year (kWh/year) 2791 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

101.6230	90.4434	97.2643	88.0402	87.1225	55.9545	55.3462	57.3894	57.8564	89.5292	92.4758	100.8188	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	136.5901	134.5883	130.7316	122.2780	117.1002	77.7146	74.3900	77.1363	80.3561	120.3349	128.4386	135.5092	(72)
Total internal gains	420.2667	428.5146	411.9877	397.6843	379.0290	332.2011	319.4120	320.5658	330.4920	376.3206	397.9018	412.4146	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)

Southwest			6.1600		36.7938		0.3000		0.8000		0.7700		37.6964 (79)
Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818 (83)	
Total gains	471.4261	515.6580	531.2212	545.4204	544.5057	496.4812	477.7955	465.7140	459.5966	472.6326	459.1790	456.1964 (84)	

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3488	76.5667	76.7860	77.9012	78.1281	79.2830	79.2830	79.5181	78.8170	78.1281	77.6756	77.2282	
alpha	6.0899	6.1044	6.1191	6.1934	6.2085	6.2855	6.2855	6.3012	6.2545	6.2085	6.1784	6.1485	
util living area	0.9828	0.9688	0.9441	0.8758	0.7468	0.5825	0.4216	0.4503	0.6700	0.8716	0.9629	0.9854 (86)	
Living	20.2884	20.4315	20.6024	20.8121	20.9431	20.9903	20.9989	20.9983	20.9772	20.8444	20.5515	20.2668	
Non living	19.3500	19.5297	19.7409	19.9943	20.1319	20.1826	20.1877	20.1896	20.1694	20.0355	19.6895	19.3300	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6359	20.4315	20.6024	20.8121	20.9431	20.9903	20.9989	20.9983	20.9772	20.8444	20.5515	20.3693 (87)	
Th 2	20.1594	20.1616	20.1638	20.1748	20.1770	20.1880	20.1880	20.1902	20.1836	20.1770	20.1726	20.1682 (88)	
util rest of house	0.9780	0.9605	0.9292	0.8455	0.6950	0.5126	0.3444	0.3720	0.5999	0.8351	0.9517	0.9813 (89)	
MIT 2	19.8367	19.5297	19.7409	19.9943	20.1319	20.1826	20.1877	20.1896	20.1694	20.0355	19.6895	19.4810 (90)	
Living area fraction										fLA = Living area / (4) =		0.4752 (91)	
MIT	20.2165	19.9582	20.1503	20.3829	20.5174	20.5664	20.5731	20.5739	20.5532	20.4199	20.0991	19.9031 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2165	19.9582	20.1503	20.3829	20.5174	20.5664	20.5731	20.5739	20.5532	20.4199	20.0991	19.9031 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9581	0.9290	0.8537	0.7172	0.5456	0.3811	0.4093	0.6324	0.8467	0.9505	0.9798 (94)	
Useful gains	461.2280	494.0662	493.4831	465.6199	390.5200	270.8857	182.0922	190.5955	290.6585	400.1996	436.4450	446.9621 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	758.6026	715.6539	646.8866	536.3851	410.6765	273.8419	182.3572	191.0061	297.9373	457.3702	608.9732	739.9101 (97)	
Space heating kWh	221.2467	148.9070	114.1322	50.9510	14.9964	0.0000	0.0000	0.0000	0.0000	42.5350	124.2203	217.9533 (98a)	
Space heating requirement - total per year (kWh/year)												934.9418	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.2467	148.9070	114.1322	50.9510	14.9964	0.0000	0.0000	0.0000	0.0000	42.5350	124.2203	217.9533 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												934.9418	
Space heating per m2										(98c) / (4) =		17.8424 (99)	

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 280.0947 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.2467	148.9070	114.1322	50.9510	14.9964	0.0000	0.0000	0.0000	0.0000	42.5350	124.2203	217.9533 (98)	
Space heating efficiency (main heating system 1)	280.0947	280.0947	280.0947	280.0947	280.0947	0.0000	0.0000	0.0000	0.0000	280.0947	280.0947	280.0947 (210)	
Space heating fuel (main heating system)	78.9900	53.1631	40.7477	18.1906	5.3541	0.0000	0.0000	0.0000	0.0000	15.1859	44.3494	77.8142 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202 (64)	
Efficiency of water heater												288.6341 (216)	
(217)m	288.6341	288.6341	288.6341	288.6341	288.6341	288.6341	288.6341	288.6341	288.6341	288.6341	288.6341	288.6341 (217)	
Fuel for water heating, kWh/month	96.6756	85.9182	92.1339	82.8197	81.5663	64.2814	63.8468	65.9758	66.2631	84.0740	87.4416	95.8376 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	8.8251	7.9711	8.8251	8.5404	8.8251	8.5404	8.8251	8.8251	8.5404	8.8251	8.5404	8.8251 (231)	
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.2718	-62.1095	-90.4986	-100.2186	-106.0354	-95.2500	-94.1484	-89.6373	-80.0309	-69.4917	-47.3907	-37.1279 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												333.7950 (211)	
Space heating fuel - main system 2												0.0000 (213)	

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.6341	
Water heating fuel used	966.8340	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9086	(230a)
Total electricity for the above, kWh/year	103.9086	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-915.2109	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	624.8212	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	333.7950	0.1569	52.3696	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8340	0.1414	136.7449	(264)
Space and water heating			189.1145	(265)
Pumps, fans and electric keep-hot	103.9086	0.1387	14.4134	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.2109	0.1349	-123.5074	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-123.5074	(269)
Total CO2, kg/year			99.5766	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	333.7950	1.5808	527.6662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8340	1.5230	1472.5086	(278)
Space and water heating			2000.1748	(279)
Pumps, fans and electric keep-hot	103.9086	1.5128	157.1929	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.2109	1.4988	-1371.7031	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1371.7031	(283)
Total Primary energy kWh/year			993.4907	(286)
Dwelling Primary energy Rate (DPER)			18.9600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.4800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1414	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3914	(18)
Number of sides sheltered	3	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3033 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2600	1.1450	9.4580			(27)
External Wall 1	34.2500	10.9000	23.3500	0.1800	4.2030			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1800	3.2976			(29a)
External Roof 1	52.4000		52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			107.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5626			(33)
Main dwelling								
Party Wall 1			28.3900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0700	0.8750
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9000	0.0200	0.1180
E16 Corner (normal)	6.2200	0.0900	0.5598
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	4.5800	0.0600	0.2748
E18 Party wall between dwellings	4.5800	0.0600	0.2748
E14 Flat roof	5.9000	0.0800	0.4720
E12 Gable (insulation at ceiling level)	10.9000	0.0600	0.6540
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.1200	0.7440
E10 Eaves (insulation at ceiling level)	7.8000	0.0600	0.4680
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0074 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5700 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff	60.4053	60.2697	60.1369	59.5127	59.3960	58.8524	58.8524	58.7517	59.0618	59.3960	59.6322	59.8792	(39)
Average = Sum(39)m / 12 =												59.5122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1528	1.1502	1.1477	1.1357	1.1335	1.1231	1.1231	1.1212	1.1271	1.1335	1.1380	1.1427	(40)
HLP (average)												1.1357	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)
Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	220.2399	194.8806	207.1310	182.1438	176.6293	159.2118	157.0799	163.2249	164.9319	183.8674	195.4841	217.8213	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	195.6706	173.1514	184.3773	163.3029	159.0703	144.1864	142.9960	148.2480	149.3860	165.5405	174.7220	193.7070	(64)
										Total per year (kWh/year) = Sum(64)m =		1994.3584	(64)
12Total per year (kWh/year)												1994	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.0129	84.4729	90.6542	81.6433	80.5124	74.0184	74.0122	76.0554	75.9203	82.9190	86.0789	94.2087	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)

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

	80.9944	89.6723	80.9944	83.6942	80.9944	83.6942	80.9944	80.9944	83.6942	80.9944	83.6942	80.9944	(67)

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

	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)

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

	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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

	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)

Water heating gains (Table 5)

	127.7055	125.7037	121.8470	113.3934	108.2156	102.8033	99.4787	102.2250	105.4448	111.4503	119.5540	126.6246	(72)

Total internal gains

	414.5761	422.8447	406.2971	392.0002	373.3383	357.4903	344.6947	345.8485	355.7811	370.6299	392.2176	406.7240	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.1700	36.7938	0.6300	0.7000	0.7700	24.4009	(77)
Southwest	6.0900	36.7938	0.6300	0.7000	0.7700	68.4801	(79)

Solar gains	92.8810	158.2107	216.4708	268.2178	300.4263	298.2538	287.5485	263.5195	234.3921	174.8565	111.2500	79.4868	(83)
Total gains	507.4571	581.0554	622.7679	660.2180	673.7646	655.7441	632.2432	609.3680	590.1732	545.4865	503.4677	486.2108	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.2412	60.3767	60.5101	61.1447	61.2649	61.8308	61.8308	61.9367	61.6116	61.2649	61.0222	60.7705	
alpha	5.0161	5.0251	5.0340	5.0763	5.0843	5.1221	5.1221	5.1291	5.1074	5.0843	5.0681	5.0514	
util living area	0.9839	0.9681	0.9396	0.8695	0.7431	0.5596	0.4071	0.4397	0.6545	0.8829	0.9670	0.9867	(86)
MIT	19.9583	20.1657	20.4129	20.7004	20.8940	20.9801	20.9967	20.9952	20.9564	20.7207	20.2988	19.9221	(87)
Th 2	19.9580	19.9601	19.9621	19.9718	19.9736	19.9820	19.9820	19.9835	19.9787	19.9736	19.9699	19.9661	(88)
util rest of house	0.9791	0.9590	0.9225	0.8346	0.6829	0.4769	0.3142	0.3445	0.5715	0.8441	0.9560	0.9827	(89)
MIT 2	18.7800	19.0401	19.3447	19.6878	19.8911	19.9715	19.9810	19.9820	19.9526	19.7199	19.2171	18.7405	(90)
Living area fraction									fLA = Living area / (4) =			0.4752	(91)
MIT	19.3399	19.5750	19.8523	20.1690	20.3676	20.4507	20.4637	20.4634	20.4296	20.1955	19.7311	19.3020	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3399	19.5750	19.8523	20.1690	20.3676	20.4507	20.4637	20.4634	20.4296	20.1955	19.7311	19.3020	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9549	0.9204	0.8419	0.7071	0.5157	0.3584	0.3898	0.6094	0.8534	0.9529	0.9794	(94)
Useful gains	495.0160	554.8323	573.1848	555.8395	476.4306	338.1767	226.6117	237.5433	359.6592	465.5190	479.7372	476.1924	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.4894	884.4561	802.9672	670.6470	514.8232	344.3304	227.3866	238.7345	373.8370	569.9347	753.2200	904.2931	(97)
Space heating kWh	307.6242	221.5072	170.9581	82.6614	28.5641	0.0000	0.0000	0.0000	0.0000	77.6853	196.9076	318.5069	(98a)
Space heating requirement - total per year (kWh/year)												1404.4149	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	307.6242	221.5072	170.9581	82.6614	28.5641	0.0000	0.0000	0.0000	0.0000	77.6853	196.9076	318.5069	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1404.4149	
Space heating per m2											(98c) / (4) =	26.8018	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	307.6242	221.5072	170.9581	82.6614	28.5641	0.0000	0.0000	0.0000	0.0000	77.6853	196.9076	318.5069	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	333.2873	239.9861	185.2201	89.5574	30.9470	0.0000	0.0000	0.0000	0.0000	84.1661	213.3344	345.0779	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	195.6706	173.1514	184.3773	163.3029	159.0703	144.1864	142.9960	148.2480	149.3860	165.5405	174.7220	193.7070	(64)

Efficiency of water heater												79.8000	(216)
(217)m	85.0699	84.6132	83.8907	82.6139	81.0505	79.8000	79.8000	79.8000	79.8000	82.4696	84.3285	85.1675	(217)
Fuel for water heating, kWh/month													
	230.0115	204.6387	219.7829	197.6699	196.2606	180.6847	179.1929	185.7745	187.2005	200.7291	207.1920	227.4424	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8290	13.5009	12.1560	8.9060	6.8793	5.6204	6.2755	8.1571	10.5953	13.9016	15.7019	17.2968	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0245	-26.3361	-39.2267	-45.7721	-50.8307	-48.0133	-47.4576	-44.0915	-38.3726	-30.8845	-20.1532	-15.4794	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5501	-16.1261	-32.4983	-49.4567	-66.0099	-66.5214	-65.7070	-55.3250	-40.1678	-23.2390	-10.1402	-5.9501	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1521.5763	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2416.5798	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8199	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3296.6422	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1521.5763	0.2100	319.5310	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2416.5798	0.2100	507.4818	(264)
Space and water heating			827.0128	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8199	0.1443	19.6030	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6423	0.1338	-56.8242	
PV Unit electricity exported	-438.6915	0.1255	-55.0660	
Total			-111.8902	(269)
Total CO2, kg/year			746.6549	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1521.5763	1.1300	1719.3812	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2416.5798	1.1300	2730.7352	(278)
Space and water heating			4450.1164	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8199	1.5338	208.3251	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6423	1.4945	-634.6363	
PV Unit electricity exported	-438.6915	0.4607	-202.1227	
Total			-836.7590	(283)
Total Primary energy kWh/year			3951.7833	(286)
Target Primary Energy Rate (TPER)			75.4200	(287)

Full SAP Calculation Printout

Property Reference	FLAT 18	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 18	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	1.91	**TER**	14.11
Environmental	99 A	**% DER < TER**			86.46
CO_2 Emissions (t/year)	0.08	**DFEE**	39.83	**TFEE**	34.48
Compliance Check	See BREL	**% DFEE < TFEE**			-15.51
% DPER < TPER	74.50	**DPER**	19.04	**TPER**	74.65

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.5610	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.1600	13.2000	15.9600	0.1200	1.9152			(29a)
EXPOSED WALL TO CORRIDOR	20.5200		20.5200	0.1200	2.4624			(29a)
External Roof 1	52.4000		52.4000	0.1000	5.2400			(30)
Total net area of external elements Aum(A, m2)			102.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2361			(33)
Main dwelling								
Party Wall 1			33.4800	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.2000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.5000	0.0800	0.6000	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E14 Flat roof	5.9000	0.0800	0.4720	
E12 Gable (insulation at ceiling level)	10.9000	0.4800	5.2320	
E10 Eaves (insulation at ceiling level)	1.6000	0.1200	0.1920	
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.2400	2.9760	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.1421 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7167	12.5810	12.4452	11.7664	11.6306	10.9518	10.9518	10.8160	11.2233	11.6306	11.9021	12.1737	(38)
Heat transfer coeff	47.8589	47.7231	47.5874	46.9085	46.7728	46.0939	46.0939	45.9582	46.3655	46.7728	47.0443	47.3158	(39)

Average = Sum(39)m / 12 = 46.8746

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9128	0.9102	0.9076	0.8947	0.8921	0.8792	0.8792	0.8766	0.8843	0.8921	0.8973	0.9025	(40)
HLP (average)												0.8940	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)

Energy content (annual) Total = Sum(45)m = 1674.4908

Distribution loss (46)m = 0.15 x (45)m												
26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)

Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(64)

Total per year (kWh/year) = Sum(64)m = 2791.0754 (64)

12Total per year (kWh/year) 2791 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

101.6390	90.4574	97.2791	88.0528	87.1345	55.9650	55.3563	57.4001	57.8674	89.5418	92.4896	100.8346	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8505	89.5130	80.8505	83.5455	80.8505	83.5455	80.8505	80.8505	83.5455	80.8505	83.5455	80.8505	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	136.6115	134.6092	130.7514	122.2955	117.1162	77.7291	74.4037	77.1507	80.3714	120.3519	128.4578	135.5303	(72)
Total internal gains	420.4293	428.6827	412.1474	397.8391	379.1751	332.3423	319.5472	320.7009	330.6317	376.4646	398.0552	412.5734	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)

Southwest			6.1600		36.7938		0.3000		0.8000		0.7700		37.6964 (79)
Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818 (83)	
Total gains	471.5887	515.8262	531.3809	545.5751	544.6518	496.6224	477.9307	465.8491	459.7363	472.7767	459.3324	456.3552 (84)	

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.0773	76.2937	76.5113	77.6186	77.8439	78.9903	78.9903	79.2236	78.5277	77.8439	77.3946	76.9504	
alpha	6.0718	6.0862	6.1008	6.1746	6.1896	6.2660	6.2660	6.2816	6.2352	6.1896	6.1596	6.1300	
util living area	0.9829	0.9691	0.9446	0.8771	0.7488	0.5846	0.4232	0.4521	0.6721	0.8729	0.9633	0.9855	(86)
Living	20.2826	20.4260	20.5977	20.8090	20.9417	20.9899	20.9988	20.9983	20.9765	20.8417	20.5468	20.2610	
Non living	19.3406	19.5208	19.7329	19.9883	20.1280	20.1796	20.1849	20.1868	20.1662	20.0302	19.6816	19.3205	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6330	20.4260	20.5977	20.8090	20.9417	20.9899	20.9988	20.9983	20.9765	20.8417	20.5468	20.3644	(87)
Th 2	20.1566	20.1588	20.1610	20.1720	20.1742	20.1853	20.1853	20.1875	20.1808	20.1742	20.1698	20.1654	(88)
util rest of house	0.9782	0.9608	0.9299	0.8468	0.6969	0.5143	0.3455	0.3732	0.6017	0.8365	0.9521	0.9815	(89)
MIT 2	19.8313	19.5208	19.7329	19.9883	20.1280	20.1796	20.1849	20.1868	20.1662	20.0302	19.6816	19.4728	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	20.2121	19.9507	20.1436	20.3780	20.5144	20.5645	20.5714	20.5722	20.5510	20.4156	20.0925	19.8962	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2121	19.9507	20.1436	20.3780	20.5144	20.5645	20.5714	20.5722	20.5510	20.4156	20.0925	19.8962	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9785	0.9584	0.9295	0.8549	0.7190	0.5474	0.3824	0.4107	0.6343	0.8480	0.9509	0.9799	(94)
Useful gains	461.4637	494.3908	493.9382	466.3971	391.6030	271.8652	182.7826	191.3187	291.6059	400.8964	436.7713	447.1811	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	761.5336	718.2666	649.2647	538.4181	412.2748	274.9251	183.0591	191.7467	299.1037	459.1023	611.2227	742.6789	(97)
Space heating kWh	223.2520	150.4445	115.5629	51.8551	15.3798	0.0000	0.0000	0.0000	0.0000	43.3052	125.6050	219.8504	(98a)
Space heating requirement - total per year (kWh/year)												945.2549	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.2520	150.4445	115.5629	51.8551	15.3798	0.0000	0.0000	0.0000	0.0000	43.3052	125.6050	219.8504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												945.2549	
Space heating per m2											(98c) / (4) =	18.0289	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.5834	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	223.2520	150.4445	115.5629	51.8551	15.3798	0.0000	0.0000	0.0000	0.0000	43.3052	125.6050	219.8504	(98)
Space heating efficiency (main heating system 1)	280.5834	280.5834	280.5834	280.5834	280.5834	0.0000	0.0000	0.0000	0.0000	280.5834	280.5834	280.5834	(210)
Space heating fuel (main heating system)	79.5671	53.6185	41.1867	18.4812	5.4814	0.0000	0.0000	0.0000	0.0000	15.4340	44.7657	78.3547	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(64)
Efficiency of water heater												288.6368	(216)
(217)m	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	(217)
Fuel for water heating, kWh/month	96.6913	85.9320	92.1484	82.8321	81.5780	64.2917	63.8567	65.9863	66.2740	84.0864	87.4551	95.8531	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.8302	7.9756	8.8302	8.5453	8.8302	8.5453	8.8302	8.8302	8.5453	8.8302	8.5453	8.8302	(231)
Lighting	16.7991	13.4769	12.1344	8.8902	6.8671	5.6104	6.2644	8.1426	10.5765	13.8769	15.6740	17.2660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.2882	-62.1415	-90.5578	-100.2888	-106.0891	-95.2739	-94.1718	-89.6578	-80.0470	-69.5244	-47.4106	-37.1404	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												336.8891	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.6368	
Water heating fuel used	966.9852	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9681	(230a)
Total electricity for the above, kWh/year	103.9681	(231)
Electricity for lighting (calculated in Appendix L)	135.5786	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-915.5913	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	627.8296	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	336.8891	0.1569	52.8468	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.9852	0.1414	136.7663	(264)
Space and water heating			189.6131	(265)
Pumps, fans and electric keep-hot	103.9681	0.1387	14.4217	(267)
Energy for lighting	135.5786	0.1443	19.5682	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.5913	0.1350	-123.5606	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-123.5606	(269)
Total CO2, kg/year			100.0423	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	336.8891	1.5807	532.5270	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.9852	1.5230	1472.7388	(278)
Space and water heating			2005.2658	(279)
Pumps, fans and electric keep-hot	103.9681	1.5128	157.2829	(281)
Energy for lighting	135.5786	1.5338	207.9550	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.5913	1.4988	-1372.2803	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1372.2803	(283)
Total Primary energy kWh/year			998.2234	(286)
Dwelling Primary energy Rate (DPER)			19.0400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.5610	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		3	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3791	0.3715	0.3336	0.3260	0.2881	0.2881	0.2805	0.3032	0.3260	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2700	1.1450	9.4695			(27)
External Wall 1	29.1600	13.1100	16.0500	0.1800	2.8890			(29a)
EXPOSED WALL TO CORRIDOR	20.5200		20.5200	0.1800	3.6936			(29a)
External Roof 1	52.4000		52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			102.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6561			(33)
Main dwelling								
Party Wall 1			33.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.2000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.5000	0.0200	0.1500
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E14 Flat roof	5.9000	0.0800	0.4720
E12 Gable (insulation at ceiling level)	10.9000	0.0600	0.6540
E10 Eaves (insulation at ceiling level)	1.6000	0.0600	0.0960
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.1200	1.4880
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3240 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.9801 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8492	26.7136	26.5807	25.9565	25.8397	25.2960	25.2960	25.1953	25.5054	25.8397	26.0760	26.3230	(38)
Heat transfer coeff	59.8293	59.6937	59.5608	58.9366	58.8198	58.2761	58.2761	58.1754	58.4855	58.8198	59.0560	59.3031	(39)
Average = Sum(39)m / 12 =												58.9360	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1411	1.1385	1.1360	1.1241	1.1219	1.1115	1.1115	1.1096	1.1155	1.1219	1.1264	1.1311	(40)
HLP (average)												1.1241	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)
Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	220.2879	194.9228	207.1753	182.1817	176.6652	159.2433	157.1104	163.2571	164.9650	183.9053	195.5256	217.8685	(62)
WWHRS	-24.5761	-21.7353	-22.7599	-18.8461	-17.5639	-15.0296	-14.0878	-14.9810	-15.5502	-18.3319	-20.7679	-24.1210	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	195.7118	173.1876	184.4154	163.3356	159.1013	144.2138	143.0226	148.2761	149.4148	165.5734	174.7578	193.7476	(64)
									Total per year (kWh/year) = Sum(64)m =			1994.7576	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	95.0288	84.4869	90.6689	81.6558	80.5243	74.0288	74.0223	76.0661	75.9313	82.9316	86.0927	94.2244	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.0251	89.7063	81.0251	83.7259	81.0251	83.7259	81.0251	81.0251	83.7259	81.0251	83.7259	81.0251	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)													
	127.7269	125.7246	121.8668	113.4109	108.2316	102.8178	99.4924	102.2394	105.4601	111.4673	119.5732	126.6457	(72)
Total internal gains													
	414.7192	422.9914	406.4374	392.1349	373.4651	357.6114	344.8105	345.9642	355.9008	370.7546	392.3510	406.8634	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.1800	36.7938	0.6300	0.7000	0.7700	24.5134	(77)
Southwest	6.0900	36.7938	0.6300	0.7000	0.7700	68.4801	(79)

Solar gains	92.9935	158.4023	216.7329	268.5425	300.7900	298.6149	287.8966	263.8385	234.6759	175.0682	111.3847	79.5830	(83)
Total gains	507.7127	581.3937	623.1703	660.6774	674.2551	656.2263	632.7071	609.8028	590.5767	545.8228	503.7357	486.4464	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.8560	60.9942	61.1303	61.7778	61.9005	62.4780	62.4780	62.5861	62.2543	61.9005	61.6528	61.3960	
alpha	5.0571	5.0663	5.0754	5.1185	5.1267	5.1652	5.1652	5.1724	5.1503	5.1267	5.1102	5.0931	
util living area													
	0.9837	0.9675	0.9384	0.8668	0.7388	0.5547	0.4030	0.4353	0.6496	0.8805	0.9664	0.9865	(86)
MIT	19.9766	20.1834	20.4284	20.7114	20.8995	20.9815	20.9970	20.9956	20.9591	20.7305	20.3141	19.9406	(87)
Th 2	19.9674	19.9695	19.9715	19.9812	19.9830	19.9915	19.9915	19.9930	19.9882	19.9830	19.9793	19.9755	(88)
util rest of house													
	0.9789	0.9583	0.9211	0.8317	0.6787	0.4732	0.3118	0.3419	0.5674	0.8414	0.9553	0.9825	(89)
MIT 2	18.8101	19.0693	19.3708	19.7081	19.9050	19.9817	19.9906	19.9916	19.9637	19.7387	19.2432	18.7708	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	19.3641	19.5984	19.8731	20.1846	20.3773	20.4565	20.4686	20.4684	20.4364	20.2097	19.7518	19.3264	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3641	19.5984	19.8731	20.1846	20.3773	20.4565	20.4686	20.4684	20.4364	20.2097	19.7518	19.3264	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9753	0.9543	0.9192	0.8393	0.7030	0.5114	0.3552	0.3863	0.6050	0.8510	0.9523	0.9792	(94)
Useful gains	495.1525	554.8218	572.8044	554.5225	474.0295	335.6004	224.7403	235.5949	357.3121	464.5210	479.6838	476.3404	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	901.2756	877.4014	796.5113	665.0751	510.3955	341.2963	225.4444	236.6816	370.5903	565.2414	747.1625	897.0389	(97)
Space heating kWh													
	302.1556	216.7735	166.4379	79.5979	27.0563	0.0000	0.0000	0.0000	0.0000	74.9359	192.5847	312.9997	(98a)
Space heating requirement - total per year (kWh/year)												1372.5414	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	302.1556	216.7735	166.4379	79.5979	27.0563	0.0000	0.0000	0.0000	0.0000	74.9359	192.5847	312.9997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1372.5414	
Space heating per m2											(98c) / (4) =	26.1786	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	302.1556	216.7735	166.4379	79.5979	27.0563	0.0000	0.0000	0.0000	0.0000	74.9359	192.5847	312.9997	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	327.3625	234.8575	180.3228	86.2383	29.3134	0.0000	0.0000	0.0000	0.0000	81.1874	208.6508	339.1112	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.7118	173.1876	184.4154	163.3356	159.1013	144.2138	143.0226	148.2761	149.4148	165.5734	174.7578	193.7476	(64)

Efficiency of water heater											79.8000	(216)
(217)m	85.0302	84.5643	83.8305	82.5410	80.9931	79.8000	79.8000	79.8000	79.8000	82.4021	84.2781	85.1292 (217)
Fuel for water heating, kWh/month												
	230.1673	204.7998	219.9860	197.8841	196.4382	180.7190	179.2263	185.8097	187.2366	200.9334	207.3584	227.5924 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.8354	13.5060	12.1606	8.9094	6.8819	5.6226	6.2779	8.1602	10.5993	13.9069	15.7078	17.3033 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.0344	-26.3504	-39.2477	-45.7962	-50.8571	-48.0381	-47.4820	-44.1143	-38.3927	-30.9010	-20.1642	-15.4880 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.5549	-16.1362	-32.5183	-49.4871	-66.0504	-66.5622	-65.7474	-55.3591	-40.1926	-23.2535	-10.1465	-5.9538 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1487.0438	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2418.1513	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.8280	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3263.2384	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1487.0438	0.2100	312.2792	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2418.1513	0.2100	507.8118	(264)
Space and water heating			820.0910	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8714	0.1443	19.6104	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	0.1338	-56.8542	
PV Unit electricity exported	-438.9620	0.1255	-55.0999	
Total			-111.9542	(269)
Total CO2, kg/year			739.6765	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1487.0438	1.1300	1680.3595	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2418.1513	1.1300	2732.5109	(278)
Space and water heating			4412.8704	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8714	1.5338	208.4040	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	1.4945	-634.9711	
PV Unit electricity exported	-438.9620	0.4607	-202.2474	
Total			-837.2185	(283)
Total Primary energy kWh/year			3914.1568	(286)
Target Primary Energy Rate (TPER)			74.6500	(287)

Full SAP Calculation Printout

Property Reference	FLAT 19	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 19	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	1.91	**TER**	14.11
Environmental	99 A	**% DER < TER**			86.46
CO_2 Emissions (t/year)	0.08	**DFEE**	39.83	**TFEE**	34.48
Compliance Check	See BREL	**% DFEE < TFEE**			-15.51
% DPER < TPER	74.50	**DPER**	19.04	**TPER**	74.65

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.5610	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.1600	13.2000	15.9600	0.1200	1.9152			(29a)
EXPOSED WALL TO CORRIDOR	20.5200		20.5200	0.1200	2.4624			(29a)
External Roof 1	52.4000		52.4000	0.1000	5.2400			(30)
Total net area of external elements Aum(A, m2)			102.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2361			(33)
Main dwelling								
Party Wall 1			33.4800	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.5000	0.0800	0.6000	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E14 Flat roof	5.9000	0.0800	0.4720	
E12 Gable (insulation at ceiling level)	10.9000	0.4800	5.2320	
E10 Eaves (insulation at ceiling level)	1.6000	0.1200	0.1920	
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.2400	2.9760	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.4000	0.0500	1.3200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.1421 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7167	12.5810	12.4452	11.7664	11.6306	10.9518	10.9518	10.8160	11.2233	11.6306	11.9021	12.1737	(38)
Heat transfer coeff	47.8589	47.7231	47.5874	46.9085	46.7728	46.0939	46.0939	45.9582	46.3655	46.7728	47.0443	47.3158	(39)

Average = Sum(39)m / 12 = 46.8746

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9128	0.9102	0.9076	0.8947	0.8921	0.8792	0.8792	0.8766	0.8843	0.8921	0.8973	0.9025	(40)
HLP (average)												0.8940	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)

Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)

Energy content (annual) Total = Sum(45)m = 1674.4908

Distribution loss (46)m = 0.15 x (45)m												
26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.6302 (55)

Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(64)

Total per year (kWh/year) = Sum(64)m = 2791.0754 (64)

12Total per year (kWh/year) 2791 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

101.6390	90.4574	97.2791	88.0528	87.1345	55.9650	55.3563	57.4001	57.8674	89.5418	92.4896	100.8346	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8505	89.5130	80.8505	83.5455	80.8505	83.5455	80.8505	80.8505	83.5455	80.8505	83.5455	80.8505	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)	136.6115	134.6092	130.7514	122.2955	117.1162	77.7291	74.4037	77.1507	80.3714	120.3519	128.4578	135.5303	(72)
Total internal gains	420.4293	428.6827	412.1474	397.8391	379.1751	332.3423	319.5472	320.7009	330.6317	376.4646	398.0552	412.5734	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)

Southwest			6.1600		36.7938		0.3000		0.8000		0.7700		37.6964 (79)
Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818 (83)	
Total gains	471.5887	515.8262	531.3809	545.5751	544.6518	496.6224	477.9307	465.8491	459.7363	472.7767	459.3324	456.3552 (84)	

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.0773	76.2937	76.5113	77.6186	77.8439	78.9903	78.9903	79.2236	78.5277	77.8439	77.3946	76.9504	
alpha	6.0718	6.0862	6.1008	6.1746	6.1896	6.2660	6.2660	6.2816	6.2352	6.1896	6.1596	6.1300	
util living area	0.9829	0.9691	0.9446	0.8771	0.7488	0.5846	0.4232	0.4521	0.6721	0.8729	0.9633	0.9855	(86)
Living	20.2826	20.4260	20.5977	20.8090	20.9417	20.9899	20.9988	20.9983	20.9765	20.8417	20.5468	20.2610	
Non living	19.3406	19.5208	19.7329	19.9883	20.1280	20.1796	20.1849	20.1868	20.1662	20.0302	19.6816	19.3205	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6330	20.4260	20.5977	20.8090	20.9417	20.9899	20.9988	20.9983	20.9765	20.8417	20.5468	20.3644	(87)
Th 2	20.1566	20.1588	20.1610	20.1720	20.1742	20.1853	20.1853	20.1875	20.1808	20.1742	20.1698	20.1654	(88)
util rest of house	0.9782	0.9608	0.9299	0.8468	0.6969	0.5143	0.3455	0.3732	0.6017	0.8365	0.9521	0.9815	(89)
MIT 2	19.8313	19.5208	19.7329	19.9883	20.1280	20.1796	20.1849	20.1868	20.1662	20.0302	19.6816	19.4728	(90)
Living area fraction										fLA = Living area / (4) =		0.4749	(91)
MIT	20.2121	19.9507	20.1436	20.3780	20.5144	20.5645	20.5714	20.5722	20.5510	20.4156	20.0925	19.8962	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2121	19.9507	20.1436	20.3780	20.5144	20.5645	20.5714	20.5722	20.5510	20.4156	20.0925	19.8962	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9785	0.9584	0.9295	0.8549	0.7190	0.5474	0.3824	0.4107	0.6343	0.8480	0.9509	0.9799	(94)
Useful gains	461.4637	494.3908	493.9382	466.3971	391.6030	271.8652	182.7826	191.3187	291.6059	400.8964	436.7713	447.1811	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	761.5336	718.2666	649.2647	538.4181	412.2748	274.9251	183.0591	191.7467	299.1037	459.1023	611.2227	742.6789	(97)
Space heating kWh	223.2520	150.4445	115.5629	51.8551	15.3798	0.0000	0.0000	0.0000	0.0000	43.3052	125.6050	219.8504	(98a)
Space heating requirement - total per year (kWh/year)												945.2549	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.2520	150.4445	115.5629	51.8551	15.3798	0.0000	0.0000	0.0000	0.0000	43.3052	125.6050	219.8504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												945.2549	
Space heating per m2											(98c) / (4) =	18.0289	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.5834	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	223.2520	150.4445	115.5629	51.8551	15.3798	0.0000	0.0000	0.0000	0.0000	43.3052	125.6050	219.8504	(98)
Space heating efficiency (main heating system 1)	280.5834	280.5834	280.5834	280.5834	280.5834	0.0000	0.0000	0.0000	0.0000	280.5834	280.5834	280.5834	(210)
Space heating fuel (main heating system)	79.5671	53.6185	41.1867	18.4812	5.4814	0.0000	0.0000	0.0000	0.0000	15.4340	44.7657	78.3547	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	279.0867	248.0315	265.9742	239.0838	235.4641	185.5695	184.3141	190.4608	191.2911	242.7042	252.4278	276.6674	(64)
Efficiency of water heater												288.6368	(216)
(217)m	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	288.6368	(217)
Fuel for water heating, kWh/month	96.6913	85.9320	92.1484	82.8321	81.5780	64.2917	63.8567	65.9863	66.2740	84.0864	87.4551	95.8531	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.8302	7.9756	8.8302	8.5453	8.8302	8.5453	8.8302	8.8302	8.5453	8.8302	8.5453	8.8302	(231)
Lighting	16.7991	13.4769	12.1344	8.8902	6.8671	5.6104	6.2644	8.1426	10.5765	13.8769	15.6740	17.2660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.2882	-62.1415	-90.5578	-100.2888	-106.0891	-95.2739	-94.1718	-89.6578	-80.0470	-69.5244	-47.4106	-37.1404	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												336.8891	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.6368	
Water heating fuel used	966.9852	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9681	(230a)
Total electricity for the above, kWh/year	103.9681	(231)
Electricity for lighting (calculated in Appendix L)	135.5786	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-915.5913	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	627.8296	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	336.8891	0.1569	52.8468	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.9852	0.1414	136.7663	(264)
Space and water heating			189.6131	(265)
Pumps, fans and electric keep-hot	103.9681	0.1387	14.4217	(267)
Energy for lighting	135.5786	0.1443	19.5682	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.5913	0.1350	-123.5606	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-123.5606	(269)
Total CO2, kg/year			100.0423	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	336.8891	1.5807	532.5270	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.9852	1.5230	1472.7388	(278)
Space and water heating			2005.2658	(279)
Pumps, fans and electric keep-hot	103.9681	1.5128	157.2829	(281)
Energy for lighting	135.5786	1.5338	207.9550	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-915.5913	1.4988	-1372.2803	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1372.2803	(283)
Total Primary energy kWh/year			998.2234	(286)
Dwelling Primary energy Rate (DPER)			19.0400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4300	(1b)	x 2.7000	(2b) =	141.5610	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.5610	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		3	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3791	0.3715	0.3336	0.3260	0.2881	0.2881	0.2805	0.3032	0.3260	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2700	1.1450	9.4695			(27)
External Wall 1	29.1600	13.1100	16.0500	0.1800	2.8890			(29a)
EXPOSED WALL TO CORRIDOR	20.5200		20.5200	0.1800	3.6936			(29a)
External Roof 1	52.4000		52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			102.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6561			(33)
Main dwelling								
Party Wall 1			33.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.5000	0.0200	0.1500
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E14 Flat roof	5.9000	0.0800	0.4720
E12 Gable (insulation at ceiling level)	10.9000	0.0600	0.6540
E10 Eaves (insulation at ceiling level)	1.6000	0.0600	0.0960
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.1200	1.4880
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3240 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.9801 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8492	26.7136	26.5807	25.9565	25.8397	25.2960	25.2960	25.1953	25.5054	25.8397	26.0760	26.3230	(38)
Heat transfer coeff	59.8293	59.6937	59.5608	58.9366	58.8198	58.2761	58.2761	58.1754	58.4855	58.8198	59.0560	59.3031	(39)
Average = Sum(39)m / 12 =												58.9360	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1411	1.1385	1.1360	1.1241	1.1219	1.1115	1.1115	1.1096	1.1155	1.1219	1.1264	1.1311	(40)
HLP (average)												1.1241	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7618 (42)
Hot water usage for mixer showers

53.7583	52.9505	51.7732	49.5208	47.8585	46.0048	44.9511	46.1195	47.4002	49.3905	51.6914	53.5524	(42a)

Hot water usage for baths

23.2411	22.8959	22.4099	21.5136	20.8426	20.0985	19.6965	20.1792	20.7047	21.5009	22.4156	23.1625	(42b)

Hot water usage for other uses

32.6721	31.4841	30.2960	29.1079	27.9198	26.7317	26.7317	27.9198	29.1079	30.2960	31.4841	32.6721	(42c)

Average daily hot water use (litres/day) 100.8135 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6716	107.3304	104.4791	100.1423	96.6209	92.8350	91.3794	94.2185	97.2128	101.1875	105.5910	109.3870	(44)
Energy conte	173.6929	152.8371	160.5804	137.0898	130.0703	114.1515	110.5155	116.6622	119.8731	137.3104	150.4338	171.2736	(45)
Energy content (annual)										Total = Sum(45)m =		1674.4908	
Distribution loss (46)m = 0.15 x (45)m	26.0539	22.9256	24.0871	20.5635	19.5106	17.1227	16.5773	17.4993	17.9810	20.5966	22.5651	25.6910	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

220.2879	194.9228	207.1753	182.1817	176.6652	159.2433	157.1104	163.2571	164.9650	183.9053	195.5256	217.8685	(62)
WWHRS -24.5761	-21.7353	-22.7599	-18.8461	-17.5639	-15.0296	-14.0878	-14.9810	-15.5502	-18.3319	-20.7679	-24.1210	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												

195.7118	173.1876	184.4154	163.3356	159.1013	144.2138	143.0226	148.2761	149.4148	165.5734	174.7578	193.7476	(64)
									Total per year (kWh/year) = Sum(64)m =		1994.7576	(64)
12Total per year (kWh/year)											1995	(64)
Electric shower(s)												

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

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

Heat gains from water heating, kWh/month

95.0288	84.4869	90.6689	81.6558	80.5243	74.0288	74.0223	76.0661	75.9313	82.9316	86.0927	94.2244	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	88.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.0251	89.7063	81.0251	83.7259	81.0251	83.7259	81.0251	81.0251	83.7259	81.0251	83.7259	81.0251	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.5409	155.1342	151.1192	142.5717	131.7821	121.6414	114.8667	113.2735	117.2885	125.8359	136.6256	146.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	31.8088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	-70.4702	(71)
Water heating gains (Table 5)													
	127.7269	125.7246	121.8668	113.4109	108.2316	102.8178	99.4924	102.2394	105.4601	111.4673	119.5732	126.6457	(72)
Total internal gains													
	414.7192	422.9914	406.4374	392.1349	373.4651	357.6114	344.8105	345.9642	355.9008	370.7546	392.3510	406.8634	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.1800	36.7938	0.6300	0.7000	0.7700	24.5134	(77)
Southwest	6.0900	36.7938	0.6300	0.7000	0.7700	68.4801	(79)

Solar gains	92.9935	158.4023	216.7329	268.5425	300.7900	298.6149	287.8966	263.8385	234.6759	175.0682	111.3847	79.5830	(83)
Total gains	507.7127	581.3937	623.1703	660.6774	674.2551	656.2263	632.7071	609.8028	590.5767	545.8228	503.7357	486.4464	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.8560	60.9942	61.1303	61.7778	61.9005	62.4780	62.4780	62.5861	62.2543	61.9005	61.6528	61.3960	
alpha	5.0571	5.0663	5.0754	5.1185	5.1267	5.1652	5.1652	5.1724	5.1503	5.1267	5.1102	5.0931	
util living area													
	0.9837	0.9675	0.9384	0.8668	0.7388	0.5547	0.4030	0.4353	0.6496	0.8805	0.9664	0.9865	(86)
MIT	19.9766	20.1834	20.4284	20.7114	20.8995	20.9815	20.9970	20.9956	20.9591	20.7305	20.3141	19.9406	(87)
Th 2	19.9674	19.9695	19.9715	19.9812	19.9830	19.9915	19.9915	19.9930	19.9882	19.9830	19.9793	19.9755	(88)
util rest of house													
	0.9789	0.9583	0.9211	0.8317	0.6787	0.4732	0.3118	0.3419	0.5674	0.8414	0.9553	0.9825	(89)
MIT 2	18.8101	19.0693	19.3708	19.7081	19.9050	19.9817	19.9906	19.9916	19.9637	19.7387	19.2432	18.7708	(90)
Living area fraction									fLA = Living area / (4) =			0.4749	(91)
MIT	19.3641	19.5984	19.8731	20.1846	20.3773	20.4565	20.4686	20.4684	20.4364	20.2097	19.7518	19.3264	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3641	19.5984	19.8731	20.1846	20.3773	20.4565	20.4686	20.4684	20.4364	20.2097	19.7518	19.3264	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9753	0.9543	0.9192	0.8393	0.7030	0.5114	0.3552	0.3863	0.6050	0.8510	0.9523	0.9792	(94)
Useful gains	495.1525	554.8218	572.8044	554.5225	474.0295	335.6004	224.7403	235.5949	357.3121	464.5210	479.6838	476.3404	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	901.2756	877.4014	796.5113	665.0751	510.3955	341.2963	225.4444	236.6816	370.5903	565.2414	747.1625	897.0389	(97)
Space heating kWh													
	302.1556	216.7735	166.4379	79.5979	27.0563	0.0000	0.0000	0.0000	0.0000	74.9359	192.5847	312.9997	(98a)
Space heating requirement - total per year (kWh/year)												1372.5414	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	302.1556	216.7735	166.4379	79.5979	27.0563	0.0000	0.0000	0.0000	0.0000	74.9359	192.5847	312.9997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1372.5414	
Space heating per m2											(98c) / (4) =	26.1786	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	302.1556	216.7735	166.4379	79.5979	27.0563	0.0000	0.0000	0.0000	0.0000	74.9359	192.5847	312.9997	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	327.3625	234.8575	180.3228	86.2383	29.3134	0.0000	0.0000	0.0000	0.0000	81.1874	208.6508	339.1112	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.7118	173.1876	184.4154	163.3356	159.1013	144.2138	143.0226	148.2761	149.4148	165.5734	174.7578	193.7476	(64)

Efficiency of water heater											79.8000	(216)
(217)m	85.0302	84.5643	83.8305	82.5410	80.9931	79.8000	79.8000	79.8000	79.8000	82.4021	84.2781	85.1292 (217)
Fuel for water heating, kWh/month												
	230.1673	204.7998	219.9860	197.8841	196.4382	180.7190	179.2263	185.8097	187.2366	200.9334	207.3584	227.5924 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.8354	13.5060	12.1606	8.9094	6.8819	5.6226	6.2779	8.1602	10.5993	13.9069	15.7078	17.3033 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.0344	-26.3504	-39.2477	-45.7962	-50.8571	-48.0381	-47.4820	-44.1143	-38.3927	-30.9010	-20.1642	-15.4880 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.5549	-16.1362	-32.5183	-49.4871	-66.0504	-66.5622	-65.7474	-55.3591	-40.1926	-23.2535	-10.1465	-5.9538 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1487.0438	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2418.1513	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.8280	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3263.2384	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1487.0438	0.2100	312.2792	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2418.1513	0.2100	507.8118	(264)
Space and water heating			820.0910	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8714	0.1443	19.6104	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	0.1338	-56.8542	
PV Unit electricity exported	-438.9620	0.1255	-55.0999	
Total			-111.9542	(269)
Total CO2, kg/year			739.6765	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1487.0438	1.1300	1680.3595	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2418.1513	1.1300	2732.5109	(278)
Space and water heating			4412.8704	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8714	1.5338	208.4040	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.8661	1.4945	-634.9711	
PV Unit electricity exported	-438.9620	0.4607	-202.2474	
Total			-837.2185	(283)
Total Primary energy kWh/year			3914.1568	(286)
Target Primary Energy Rate (TPER)			74.6500	(287)

Full SAP Calculation Printout

Property Reference	FLAT 1	**Issued on Date**	17/06/2025
Assessment Reference	Flat 1	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	2.16	**TER**	18.20
Environmental	99 A	**% DER < TER**			88.13
CO_2 Emissions (t/year)	0.09	**DFEE**	45.45	**TFEE**	52.39
Compliance Check	See BREL	**% DFEE < TFEE**			13.25
% DPER < TPER	77.72	**DPER**	21.54	**TPER**	96.70

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.5660	(5)

---

2. Ventilation rate

---

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			9.9000	0.8687	8.6004			(27)
Door to Corridors			2.2000	0.9000	1.9800			(26)
Opaque			2.6400	0.9000	2.3760			(26)
Ground Floor			50.5800	0.0900	4.5522			(28a)
External Wall	52.1900	12.5400	39.6500	0.1200	4.7580			(29a)
Internal Exposed Wall	30.9000	2.2000	28.7000	0.1200	3.4440			(29a)
Total net area of external elements Aum(A, m2)			133.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7106			(33)
Main dwelling								
Party Ceiling 1			50.5800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.6000	0.1300	3.9780

E7 Party floor between dwellings (in blocks of flats)	18.1000	0.0700	1.2670	
E16 Corner (normal)	13.5000	0.0900	1.2150	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.6000	0.0800	0.4480	
P8 Party Wall - Exposed floor (inverted)	6.9000	0.2400	1.6560	
E2 Other lintels (including other steel lintels)	7.1000	0.2000	1.4200	
E3 Sill	4.9000	0.0400	0.1960	
E4 Jamb	29.2000	0.0500	1.4600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.3970 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.1076 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9144	12.7708	12.6271	11.9089	11.7652	11.0470	11.0470	10.9033	11.3343	11.7652	12.0525	12.3398	(38)
Heat transfer coeff	50.0220	49.8784	49.7347	49.0165	48.8728	48.1546	48.1546	48.0109	48.4419	48.8728	49.1601	49.4474	(39)
Average = Sum(39)m / 12 =												48.9806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9890	0.9861	0.9833	0.9691	0.9662	0.9520	0.9520	0.9492	0.9577	0.9662	0.9719	0.9776	(40)
HLP (average)												0.9684	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)
Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.6302	(55)
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(64)
										Total per year (kWh/year) = Sum(64)m =		2762.5671	(64)
12Total per year (kWh/year)												2763	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	100.6557	89.5922	96.3701	87.2767	86.3982	55.3188	54.7307	56.7397	57.1888	88.7645	91.6380	99.8650	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.7321	83.8463	75.7321	78.2566	75.7321	78.2566	75.7321	75.7321	78.2566	75.7321	78.2566	75.7321	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	135.2899	133.3217	129.5297	121.2177	116.1266	76.8317	73.5628	76.2630	79.4289	119.3071	127.2750	134.2271	(72)
Total internal gains	408.3701	416.0595	400.2639	386.1961	368.1283	321.5341	309.1780	310.3348	319.9145	365.5485	386.4932	400.7445	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.5400	36.7938	0.3000	0.8000	0.7700	9.4241	(77)
Southwest	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(79)
Northwest	6.1600	11.2829	0.3000	0.8000	0.7700	11.5597	(81)

Solar gains	34.4468	62.5154	95.7351	135.7153	167.6159	173.2672	164.1918	139.3433	109.4149	71.8427	41.9586	29.0269	(83)
Total gains	442.8170	478.5749	495.9990	521.9114	535.7442	494.8013	473.3698	449.6781	429.3295	437.3912	428.4518	429.7714	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.2191	70.4213	70.6247	71.6596	71.8702	72.9422	72.9422	73.1604	72.5096	71.8702	71.4502	71.0350	
alpha	5.6813	5.6948	5.7083	5.7773	5.7913	5.8628	5.8628	5.8774	5.8340	5.7913	5.7633	5.7357	
util living area	0.9871	0.9781	0.9599	0.9011	0.7746	0.6076	0.4454	0.4873	0.7297	0.9086	0.9736	0.9889	(86)
Living	20.1304	20.2683	20.4644	20.7308	20.9133	20.9834	20.9977	20.9962	20.9539	20.7569	20.4169	20.1122	
Non living	19.0991	19.2741	19.5195	19.8460	20.0420	20.1142	20.1227	20.1245	20.0890	19.8834	19.4715	19.0836	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5551	20.2683	20.4644	20.7308	20.9133	20.9834	20.9977	20.9962	20.9539	20.7569	20.4169	20.2364	(87)
Th 2	20.0925	20.0949	20.0973	20.1092	20.1116	20.1235	20.1235	20.1259	20.1187	20.1116	20.1068	20.1020	(88)
util rest of house	0.9833	0.9718	0.9481	0.8734	0.7212	0.5309	0.3579	0.3967	0.6546	0.8774	0.9648	0.9856	(89)
MIT 2	19.6965	19.2741	19.5195	19.8460	20.0420	20.1142	20.1227	20.1245	20.0890	19.8834	19.4715	19.2671	(90)
Living area fraction										fLA = Living area / (4) =		0.5045	(91)
MIT	20.1297	19.7757	19.9962	20.2924	20.4816	20.5528	20.5642	20.5643	20.5254	20.3241	19.9485	19.7562	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1297	19.7757	19.9962	20.2924	20.4816	20.5528	20.5642	20.5643	20.5254	20.3241	19.9485	19.7562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9691	0.9466	0.8797	0.7444	0.5692	0.4021	0.4425	0.6906	0.8857	0.9630	0.9840	(94)
Useful gains	435.4810	463.8056	469.4910	459.1037	398.8169	281.6218	190.3377	198.9818	296.5098	387.3971	412.5850	422.9066	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	791.8350	741.9772	671.2317	558.4174	429.1820	286.6540	190.8937	199.9328	311.2591	475.2461	631.6337	769.2120	(97)
Space heating kWh	265.1274	186.9313	150.0951	71.5059	22.5916	0.0000	0.0000	0.0000	0.0000	65.3596	157.7151	257.6512	(98a)
Space heating requirement - total per year (kWh/year)												1176.9772	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.1274	186.9313	150.0951	71.5059	22.5916	0.0000	0.0000	0.0000	0.0000	65.3596	157.7151	257.6512	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1176.9772	
Space heating per m2											(98c) / (4) =	23.2696	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 285.6634 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	265.1274	186.9313	150.0951	71.5059	22.5916	0.0000	0.0000	0.0000	0.0000	65.3596	157.7151	257.6512	(98)
Space heating efficiency (main heating system 1)	285.6634	285.6634	285.6634	285.6634	285.6634	0.0000	0.0000	0.0000	0.0000	285.6634	285.6634	285.6634	(210)
Space heating fuel (main heating system)	92.8111	65.4376	52.5427	25.0315	7.9085	0.0000	0.0000	0.0000	0.0000	22.8799	55.2101	90.1940	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(64)
Efficiency of water heater												288.6643	(216)
(217)m	288.6643	288.6643	288.6643	288.6643	288.6643	288.6643	288.6643	288.6643	288.6643	288.6643	288.6643	288.6643	(217)
Fuel for water heating, kWh/month	95.6577	85.0225	91.1926	82.0157	80.8031	63.6124	63.1989	65.2920	65.5607	83.2685	86.5596	94.8338	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5186	7.6942	8.5186	8.2438	8.5186	8.2438	8.5186	8.5186	8.2438	8.5186	8.2438	8.5186	(231)
Lighting	15.7356	12.6237	11.3663	8.3274	6.4323	5.2553	5.8678	7.6272	9.9069	12.9984	14.6817	16.1730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.4137	-62.4109	-90.9768	-100.2805	-105.1740	-93.7356	-92.6589	-88.3158	-78.9846	-69.6129	-47.5446	-37.2197	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												412.0155	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												288.6643	
Water heating fuel used												957.0173	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	100.2995	(230a)
Total electricity for the above, kWh/year	100.2995	(231)
Electricity for lighting (calculated in Appendix L)	126.9957	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-910.3279	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	686.0001	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	412.0155	0.1563	64.4107	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	957.0173	0.1414	135.3551	(264)
Space and water heating			199.7658	(265)
Pumps, fans and electric keep-hot	100.2995	0.1387	13.9128	(267)
Energy for lighting	126.9957	0.1443	18.3294	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-910.3279	0.1351	-122.9790	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-122.9790	(269)
Total CO2, kg/year			109.0290	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.1600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	412.0155	1.5788	650.4705	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	957.0173	1.5230	1457.5525	(278)
Space and water heating			2108.0230	(279)
Pumps, fans and electric keep-hot	100.2995	1.5128	151.7331	(281)
Energy for lighting	126.9957	1.5338	194.7902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-910.3279	1.4993	-1364.8773	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1364.8773	(283)
Total Primary energy kWh/year			1089.6691	(286)
Dwelling Primary energy Rate (DPER)			21.5400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.5660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1464	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3964	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3370	(21)

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

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4297	0.4212	0.4128	0.3707	0.3623	0.3201	0.3201	0.3117	0.3370	0.3623	0.3791	0.3960 (22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5568	0.5656	0.5719	0.5784 (25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			7.8000	1.1450	8.9313			(27)
Ground Floor			50.5800	0.1300	6.5754			(28a)
External Wall	52.1900	10.4400	41.7500	0.1800	7.5150			(29a)
Internal Exposed Wall	30.9000	2.0000	28.7000	0.1800	5.1660			(29a)
Total net area of external elements Aum(A, m2)			133.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.0277			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.6000	0.1600	4.8960
E7 Party floor between dwellings (in blocks of flats)	18.1000	0.0700	1.2670
E16 Corner (normal)	13.5000	0.0900	1.2150
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.6000	0.0200	0.1120
P8 Party Wall - Exposed floor (inverted)	6.9000	0.2400	1.6560
E2 Other lintels (including other steel lintels)	7.1000	0.0500	0.3550
E3 Sill	4.9000	0.0500	0.2450
E4 Jamb	29.2000	0.0500	1.4600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9630 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 43.9907 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.6931	26.5315	26.3732	25.6296	25.4904	24.8427	24.8427	24.7228	25.0922	25.4904	25.7719	26.0662	(38)
Heat transfer coeff	70.6838	70.5222	70.3639	69.6203	69.4811	68.8334	68.8334	68.7135	69.0829	69.4811	69.7626	70.0569	(39)

Average = Sum(39)m / 12 = 69.6196

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3975	1.3943	1.3911	1.3764	1.3737	1.3609	1.3609	1.3585	1.3658	1.3737	1.3793	1.3851	(40)
HLP (average)												1.3764	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)

Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)

Energy content (annual) Total = Sum(45)m = 1645.9825

25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)

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

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

217.3306	192.3208	204.4415	179.8478	174.4509	157.3000	155.2289	161.2709	162.9241	181.5675	192.9644	214.9525	(62)
-24.1578	-21.3654	-22.3726	-18.5254	-17.2650	-14.7738	-13.8481	-14.7260	-15.2855	-18.0199	-20.4144	-23.7104	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

193.1728	170.9554	182.0689	161.3224	157.1859	142.5262	141.3809	146.5449	147.6386	163.5476	172.5500	191.2421	(64)

Total per year (kWh/year) = Sum(64)m = 1970.1357 (64)

12Total per year (kWh/year) 1970 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

94.0456	83.6217	89.7599	80.8798	79.7880	73.3827	73.3967	75.4057	75.2527	82.1543	85.2411	93.2548	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8520	87.3004	78.8520	81.4804	78.8520	81.4804	78.8520	78.8520	81.4804	78.8520	81.4804	78.8520	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)

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

	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)													
	126.4053	124.4371	120.6450	112.3331	107.2420	101.9204	98.6515	101.3517	104.5176	110.4225	118.3904	125.3425	(72)
Total internal gains													
	405.6053	413.6290	397.4991	383.5353	365.3635	349.8466	337.3866	338.5433	348.2271	362.7837	383.8324	397.9797	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.2100	36.7938	0.6300	0.7000	0.7700	13.6061	(77)
Southwest	1.7300	36.7938	0.6300	0.7000	0.7700	19.4533	(79)
Northwest	4.8600	11.2829	0.6300	0.7000	0.7700	16.7583	(81)

Solar gains	49.8177	90.4243	138.5080	196.4008	242.6057	250.8013	237.6585	201.6664	158.3165	103.9247	60.6838	41.9776	(83)
Total gains	455.4230	504.0533	536.0070	579.9361	607.9692	600.6479	575.0450	540.2097	506.5436	466.7084	444.5161	439.9573	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.6932	49.8070	49.9191	50.4523	50.5533	51.0290	51.0290	51.1181	50.8447	50.5533	50.3493	50.1378	
alpha	4.3129	4.3205	4.3279	4.3635	4.3702	4.4019	4.4019	4.4079	4.3896	4.3702	4.3566	4.3425	
util living area	0.9898	0.9831	0.9697	0.9294	0.8377	0.6720	0.5114	0.5609	0.7889	0.9420	0.9816	0.9912	(86)
MIT	19.5204	19.7017	19.9839	20.3824	20.7213	20.9247	20.9820	20.9733	20.8429	20.4238	19.9149	19.4943	(87)
Th 2	19.7653	19.7677	19.7701	19.7814	19.7836	19.7935	19.7935	19.7953	19.7896	19.7836	19.7793	19.7748	(88)
util rest of house	0.9865	0.9776	0.9593	0.9040	0.7802	0.5690	0.3788	0.4257	0.6993	0.9158	0.9745	0.9884	(89)
MIT 2	18.0898	18.3208	18.6772	19.1721	19.5554	19.7524	19.7883	19.7866	19.6881	19.2331	18.6010	18.0633	(90)
Living area fraction										fLA = Living area / (4) =		0.5045	(91)
MIT	18.8116	19.0175	19.3365	19.7828	20.1436	20.3438	20.3906	20.3854	20.2707	19.8339	19.2640	18.7853	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8116	19.0175	19.3365	19.7828	20.1436	20.3438	20.3906	20.3854	20.2707	19.8339	19.2640	18.7853	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9732	0.9547	0.9041	0.7990	0.6184	0.4460	0.4941	0.7383	0.9172	0.9706	0.9852	(94)
Useful gains	447.6866	490.5461	511.7251	524.3001	485.7648	371.4257	256.4589	266.9131	373.9623	428.0477	431.4518	433.4332	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1025.7329	995.5977	903.2268	757.6610	586.6728	395.3680	260.9186	273.8478	426.2911	641.5806	848.5894	1021.8010	(97)
Space heating kWh	430.0664	339.3947	291.2772	168.0198	75.0756	0.0000	0.0000	0.0000	0.0000	158.8685	300.3390	437.7457	(98a)
Space heating requirement - total per year (kWh/year)												2200.7869	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	430.0664	339.3947	291.2772	168.0198	75.0756	0.0000	0.0000	0.0000	0.0000	158.8685	300.3390	437.7457	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2200.7869	
Space heating per m2											(98c) / (4) =	43.5110	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	430.0664	339.3947	291.2772	168.0198	75.0756	0.0000	0.0000	0.0000	0.0000	158.8685	300.3390	437.7457	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	465.9441	367.7082	315.5766	182.0367	81.3387	0.0000	0.0000	0.0000	0.0000	172.1219	325.3944	474.2640	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	193.1728	170.9554	182.0689	161.3224	157.1859	142.5262	141.3809	146.5449	147.6386	163.5476	172.5500	191.2421	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8007	85.5673	85.1080	84.1511	82.5028	79.8000	79.8000	79.8000	79.8000	83.9947	85.2901	85.8559	(217)
Fuel for water heating, kWh/month	225.1414	199.7905	213.9270	191.7056	190.5218	178.6043	177.1690	183.6402	185.0107	194.7118	202.3095	222.7477	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.3839	13.1438	11.8345	8.6705	6.6973	5.4718	6.1095	7.9414	10.3151	13.5339	15.2865	16.8392	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.4212	-25.4665	-37.9498	-44.3059	-49.2256	-46.5090	-45.9744	-42.7044	-37.1490	-29.8789	-19.4841	-14.9603	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.2652	-15.5209	-31.2839	-47.6153	-63.5567	-64.0476	-63.2597	-53.2590	-38.6634	-22.3648	-9.7571	-5.7249	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2384.3845	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2365.2795	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	132.2273	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-833.3478	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4134.5436	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2384.3845	0.2100	500.7208	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2365.2795	0.2100	496.7087	(264)
Space and water heating			997.4294	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2273	0.1443	19.0845	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-411.0292	0.1338	-54.9976	
PV Unit electricity exported	-422.3186	0.1255	-53.0097	
Total			-108.0073	(269)
Total CO2, kg/year			920.4359	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.2000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2384.3845	1.1300	2694.3545	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2365.2795	1.1300	2672.7658	(278)
Space and water heating			5367.1204	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2273	1.5338	202.8147	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-411.0292	1.4945	-614.2728	
PV Unit electricity exported	-422.3186	0.4607	-194.5750	
Total			-808.8479	(283)
Total Primary energy kWh/year			4891.1880	(286)
Target Primary Energy Rate (TPER)			96.7000	(287)

Full SAP Calculation Printout

Property Reference	FLAT 20	**Issued on Date**	17/06/2025
Assessment Reference	Flat 20	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	1.85	**TER**	13.97
Environmental	99 A	**% DER < TER**			86.76
CO_2 Emissions (t/year)	0.09	**DFEE**	39.40	**TFEE**	37.05
Compliance Check	See BREL	**% DFEE < TFEE**			-6.35
% DPER < TPER	74.97	**DPER**	18.47	**TPER**	73.81

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0000	(1b)	x 2.7000	(2b) =	162.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	162.0000	(5)

---

2. Ventilation rate

---

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			12.3200	0.8687	10.7027			(27)
OPAQUE			3.9600	0.9000	3.5640			(26)
Doors			2.2000	0.9000	1.9800			(26)
External Wall 1	53.0600	18.4800	34.5800	0.1200	4.1496			(29a)
Exposed Internal Wall	8.3700		8.3700	0.1200	1.0044			(29a)
External Roof 1	60.0000		60.0000	0.1000	6.0000			(30)
Total net area of external elements Aum(A, m2)			121.4300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.4007			(33)
Main dwelling								
Party Wall 1			28.4800	0.0000	0.0000			(32)
Party Floor 1			60.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	14.3500	0.0700	1.0045	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.4000	0.0800	0.6720	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.5500	0.0000	0.0000	
E25 Staggered party wall between dwellings	8.1000	0.0800	0.6480	
E16 Corner (normal)	13.5000	0.0900	1.2150	
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860	
E14 Flat roof	12.0000	0.0800	0.9600	
E10 Eaves (insulation at ceiling level)	6.4000	0.1200	0.7680	
E12 Gable (insulation at ceiling level)	4.3500	0.4800	2.0880	
P4 Party wall - Roof (insulation at ceiling level)	10.5500	0.2400	2.5320	
E2 Other lintels (including other steel lintels)	8.4000	0.2000	1.6800	
E3 Sill	5.6000	0.0400	0.2240	
E4 Jamb	35.2000	0.0500	1.7600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.0655 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.4662 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3196	15.1492	14.9788	14.1268	13.9564	13.1044	13.1044	12.9340	13.4452	13.9564	14.2972	14.6380	(38)
Heat transfer coeff	55.7858	55.6154	55.4450	54.5930	54.4226	53.5706	53.5706	53.4002	53.9114	54.4226	54.7634	55.1042	(39)

Average = Sum(39)m / 12 = 54.5504

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9298	0.9269	0.9241	0.9099	0.9070	0.8928	0.8928	0.8900	0.8985	0.9070	0.9127	0.9184	(40)
HLP (average)												0.9092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9816 (42)

Hot water usage for mixer showers

57.4451	56.5818	55.3238	52.9169	51.1406	49.1598	48.0339	49.2823	50.6509	52.7777	55.2363	57.2250	(42a)

Hot water usage for baths

24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)

Hot water usage for other uses

34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)

Average daily hot water use (litres/day) 107.7295 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.1955	114.6935	111.6463	107.0121	103.2491	99.2034	97.6481	100.6821	103.8820	108.1293	112.8350	116.8914	(44)
Energy conte	185.6090	163.3220	171.5963	146.4943	138.9931	121.9821	118.0969	124.6655	128.0969	146.7305	160.7541	183.0237	(45)

Energy content (annual) Total = Sum(45)m = 1789.3645

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

27.8413	24.4983	25.7394	21.9741	20.8490	18.2973	17.7145	18.6998	19.2145	22.0096	24.1131	27.4536	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)
Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

291.0028	258.5164	276.9901	248.4883	244.3869	193.4001	191.8955	198.4641	199.5149	252.1243	262.7481	288.4175	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS

Output from w/h

291.0028	258.5164	276.9901	248.4883	244.3869	193.4001	191.8955	198.4641	199.5149	252.1243	262.7481	288.4175	(64)

Total per year (kWh/year) = Sum(64)m = 2905.9491 (64)

12Total per year (kWh/year) 2906 (64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

105.6011	93.9436	100.9418	91.1797	90.1013	58.5687	57.8772	60.0612	60.6018	92.6740	95.9211	104.7415	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.6256	97.0140	87.6256	90.5464	87.6256	90.5464	87.6256	87.6256	90.5464	87.6256	90.5464	87.6256	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)	141.9369	139.7970	135.6745	126.6385	121.1039	81.3454	77.7919	80.7274	84.1692	124.5618	133.2238	140.7816	(72)
Total internal gains	455.2339	464.2772	446.2437	430.5008	409.8920	361.6319	347.5267	348.6676	359.5527	406.6522	430.3884	446.4477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	75.3929	128.4219	175.7125	217.7163	243.8604	242.0969	233.4073	213.9026	190.2595	141.9336	90.3033	64.5206	(83)
Total gains	530.6268	592.6991	621.9562	648.2171	653.7524	603.7288	580.9339	562.5702	549.8121	548.5858	520.6917	510.9683	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.6904	74.9193	75.1495	76.3223	76.5613	77.7790	77.7790	78.0272	77.2873	76.5613	76.0849	75.6143	
alpha	5.9794	5.9946	6.0100	6.0882	6.1041	6.1853	6.1853	6.2018	6.1525	6.1041	6.0723	6.0410	
util living area	0.9848	0.9698	0.9420	0.8669	0.7304	0.5603	0.4048	0.4352	0.6555	0.8723	0.9662	0.9874	(86)
Living	20.2387	20.4030	20.5937	20.8157	20.9465	20.9915	20.9990	20.9985	20.9783	20.8365	20.5180	20.2143	
Non living	19.2742	19.4807	19.7159	19.9833	20.1196	20.1689	20.1733	20.1755	20.1554	20.0128	19.6358	19.2512	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6105	20.4030	20.5937	20.8157	20.9465	20.9915	20.9990	20.9985	20.9783	20.8365	20.5180	20.3242	(87)
Th 2	20.1423	20.1447	20.1471	20.1591	20.1615	20.1736	20.1736	20.1760	20.1688	20.1615	20.1567	20.1519	(88)
util rest of house	0.9805	0.9617	0.9266	0.8351	0.6777	0.4913	0.3293	0.3580	0.5849	0.8356	0.9557	0.9838	(89)
MIT 2	19.7962	19.4807	19.7159	19.9833	20.1196	20.1689	20.1733	20.1755	20.1554	20.0128	19.6358	19.4135	(90)
Living area fraction									fLA = Living area / (4) =			0.4833	(91)
MIT	20.1898	19.9265	20.1402	20.3856	20.5193	20.5665	20.5724	20.5733	20.5531	20.4109	20.0622	19.8537	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1898	19.9265	20.1402	20.3856	20.5193	20.5665	20.5724	20.5733	20.5531	20.4109	20.0622	19.8537	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9592	0.9265	0.8443	0.7009	0.5245	0.3658	0.3954	0.6183	0.8473	0.9543	0.9823	(94)
Useful gains	520.4386	568.5415	576.2408	547.2624	458.1959	316.6527	212.5317	222.4207	339.9487	464.8412	496.8994	501.9334	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	886.4247	835.7027	756.2790	627.0348	479.9678	319.6274	212.8024	222.8526	347.8971	533.9366	709.8533	862.5843	(97)
Space heating kWh	272.2937	179.5324	133.9484	57.4361	16.1982	0.0000	0.0000	0.0000	0.0000	51.4070	153.3268	268.3243	(98a)
Space heating requirement - total per year (kWh/year)												1132.4669	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	272.2937	179.5324	133.9484	57.4361	16.1982	0.0000	0.0000	0.0000	0.0000	51.4070	153.3268	268.3243	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1132.4669	
Space heating per m2											(98c) / (4) =	18.8744	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	297.9265	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	272.2937	179.5324	133.9484	57.4361	16.1982	0.0000	0.0000	0.0000	0.0000	51.4070	153.3268	268.3243	(98)
Space heating efficiency (main heating system 1)	297.9265	297.9265	297.9265	297.9265	297.9265	0.0000	0.0000	0.0000	0.0000	297.9265	297.9265	297.9265	(210)
Space heating fuel (main heating system)	91.3963	60.2606	44.9602	19.2786	5.4370	0.0000	0.0000	0.0000	0.0000	17.2549	51.4646	90.0639	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	291.0028	258.5164	276.9901	248.4883	244.3869	193.4001	191.8955	198.4641	199.5149	252.1243	262.7481	288.4175	(64)
Efficiency of water heater												288.7483	(216)
(217)m	288.7483	288.7483	288.7483	288.7483	288.7483	288.7483	288.7483	288.7483	288.7483	288.7483	288.7483	288.7483	(217)
Fuel for water heating, kWh/month	100.7808	89.5300	95.9279	86.0571	84.6367	66.9788	66.4577	68.7326	69.0965	87.3163	90.9956	99.8855	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1051	9.1272	10.1051	9.7791	10.1051	9.7791	10.1051	10.1051	9.7791	10.1051	9.7791	10.1051	(231)
Lighting	18.2069	14.6062	13.1513	9.6352	7.4425	6.0806	6.7893	8.8250	11.4628	15.0398	16.9874	18.7129	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-44.1859	-63.8901	-93.7688	-104.7044	-111.5792	-100.9172	-99.6906	-94.4712	-83.7732	-71.8263	-48.5533	-37.8465	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												380.1162	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	288.7483	
Water heating fuel used	1006.3954	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	118.9793	(230a)
Total electricity for the above, kWh/year	118.9793	(231)
Electricity for lighting (calculated in Appendix L)	146.9398	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-955.2067	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	697.2240	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	380.1162	0.1570	59.6910	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1006.3954	0.1414	142.3460	(264)
Space and water heating			202.0370	(265)
Pumps, fans and electric keep-hot	118.9793	0.1387	16.5039	(267)
Energy for lighting	146.9398	0.1443	21.2080	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-955.2067	0.1348	-128.7183	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-128.7183	(269)
Total CO2, kg/year			111.0306	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	380.1162	1.5813	601.0865	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1006.3954	1.5230	1532.7820	(278)
Space and water heating			2133.8686	(279)
Pumps, fans and electric keep-hot	118.9793	1.5128	179.9919	(281)
Energy for lighting	146.9398	1.5338	225.3812	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-955.2067	1.4981	-1430.9474	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1430.9474	(283)
Total Primary energy kWh/year			1108.2942	(286)
Dwelling Primary energy Rate (DPER)			18.4700	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		60.0000	(1b)	x 2.7000	(2b) =	162.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1235	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3735	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3174 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4047	0.3968	0.3889	0.3492	0.3412	0.3016	0.3016	0.2936	0.3174	0.3412	0.3571	0.3730	(22b)
Effective ac	0.5819	0.5787	0.5756	0.5610	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5638	0.5696	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			6.1600	1.0000	6.1600			(26)
TER Opening Type			8.8400	1.1450	10.1221			(27)
External Wall 1	53.0600	15.0000	38.0600	0.1800	6.8508			(29a)
Exposed Internal Wall	8.3700		8.3700	0.1800	1.5066			(29a)
External Roof 1	60.0000		60.0000	0.1100	6.6000			(30)
Total net area of external elements Aum(A, m2)			121.4300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2395			(33)
Main dwelling								
Party Wall 1			28.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	14.3500	0.0700	1.0045
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.4000	0.0200	0.1680
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.5500	0.0000	0.0000
E25 Staggered party wall between dwellings	8.1000	0.0600	0.4860
E16 Corner (normal)	13.5000	0.0900	1.2150
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
E14 Flat roof	12.0000	0.0800	0.9600
E10 Eaves (insulation at ceiling level)	6.4000	0.0600	0.3840
E12 Gable (insulation at ceiling level)	4.3500	0.0600	0.2610
P4 Party wall - Roof (insulation at ceiling level)	10.5500	0.1200	1.2660
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	35.2000	0.0500	1.7600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7185 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9580 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.1086	30.9386	30.7719	29.9891	29.8427	29.1609	29.1609	29.0346	29.4235	29.8427	30.1390	30.4487	(38)
Heat transfer coeff	70.0667	69.8966	69.7300	68.9472	68.8007	68.1189	68.1189	67.9927	68.3815	68.8007	69.0970	69.4068	(39)
Average = Sum(39)m / 12 =												68.9465	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1678	1.1649	1.1622	1.1491	1.1467	1.1353	1.1353	1.1332	1.1397	1.1467	1.1516	1.1568	(40)
HLP (average)												1.1491	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9816 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
57.4451	56.5818	55.3238	52.9169	51.1406	49.1598	48.0339	49.2823	50.6509	52.7777	55.2363	57.2250	(42a)

Hot water usage for baths

24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)

Hot water usage for other uses

34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)

Average daily hot water use (litres/day) 107.7295 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.1955	114.6935	111.6463	107.0121	103.2491	99.2034	97.6481	100.6821	103.8820	108.1293	112.8350	116.8914	(44)
Energy conte	185.6090	163.3220	171.5963	146.4943	138.9931	121.9821	118.0969	124.6655	128.0969	146.7305	160.7541	183.0237	(45)
Energy content (annual)										Total = Sum(45)m =		1789.3645	
Distribution loss (46)m = 0.15 x (45)m	27.8413	24.4983	25.7394	21.9741	20.8490	18.2973	17.7145	18.6998	19.2145	22.0096	24.1131	27.4536	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.2039	205.4077	218.1912	191.5861	185.5880	167.0740	164.6918	171.2604	173.1888	193.3254	205.8460	229.6186	(62)
WWHRS -26.2615	-23.2259	-24.3208	-20.1386	-18.7684	-16.0603	-15.0540	-16.0084	-16.6166	-19.5891	-22.1921	-25.7752	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
205.9424	182.1819	193.8704	171.4475	166.8196	151.0137	149.6379	155.2520	156.5722	173.7363	183.6539	203.8435	(64)
									Total per year (kWh/year) = Sum(64)m =		2093.9712	(64)
12Total per year (kWh/year)											2094	(64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

98.9909	87.9731	94.3317	84.7828	83.4911	76.6325	76.5432	78.7272	78.6657	86.0638	89.5242	98.1313	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	92.5619	102.4793	92.5619	95.6473	92.5619	95.6473	92.5619	92.5619	95.6473	92.5619	95.6473	92.5619	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)													
	133.0523	130.9124	126.7899	117.7539	112.2193	106.4341	102.8806	105.8161	109.2579	115.6772	124.3392	131.8969	(72)
Total internal gains													
	454.2857	463.8578	445.2955	429.7171	408.9437	391.8215	377.5518	378.6927	389.7423	405.7039	429.6047	445.4994	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.4200	36.7938	0.6300	0.7000	0.7700	49.7015	(77)
Southwest	4.4200	36.7938	0.6300	0.7000	0.7700	49.7015	(79)

Solar gains	99.4029	169.3199	231.6709	287.0515	321.5216	319.1965	307.7395	282.0233	250.8506	187.1346	119.0618	85.0682	(83)
Total gains	553.6886	633.1777	676.9664	716.7686	730.4653	711.0181	685.2913	660.7159	640.5929	592.8385	548.6664	530.5676	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.4672	59.6118	59.7543	60.4327	60.5614	61.1675	61.1675	61.2811	60.9326	60.5614	60.3017	60.0326	
alpha	4.9645	4.9741	4.9836	5.0288	5.0374	5.0778	5.0778	5.0854	5.0622	5.0374	5.0201	5.0022	
util living area													
	0.9870	0.9741	0.9508	0.8905	0.7747	0.5923	0.4336	0.4678	0.6876	0.9021	0.9733	0.9893	(86)
MIT	19.8894	20.0939	20.3450	20.6498	20.8677	20.9734	20.9954	20.9933	20.9439	20.6769	20.2383	19.8559	(87)
Th 2	19.9459	19.9481	19.9504	19.9609	19.9629	19.9721	19.9721	19.9738	19.9685	19.9629	19.9589	19.9547	(88)
util rest of house													
	0.9830	0.9665	0.9361	0.8589	0.7157	0.5060	0.3343	0.3663	0.6032	0.8670	0.9640	0.9860	(89)
MIT 2	18.6846	18.9425	19.2546	19.6239	19.8580	19.9578	19.9707	19.9716	19.9343	19.6642	19.1348	18.6488	(90)
Living area fraction									fLA = Living area / (4) =			0.4833	(91)
MIT	19.2669	19.4990	19.7816	20.1197	20.3460	20.4487	20.4660	20.4655	20.4222	20.1537	19.6682	19.2322	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2669	19.4990	19.7816	20.1197	20.3460	20.4487	20.4660	20.4655	20.4222	20.1537	19.6682	19.2322	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9625	0.9333	0.8642	0.7387	0.5469	0.3824	0.4155	0.6419	0.8743	0.9608	0.9830	(94)
Useful gains	542.4706	609.4272	631.8462	619.4596	539.6199	388.8768	262.0829	274.4986	411.1714	518.3026	527.1614	521.5572	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1048.6820	1020.4223	926.1266	773.5691	594.8543	398.4081	263.3481	276.4210	432.3251	657.3002	868.4222	1043.3389	(97)
Space heating kWh													
	376.6213	276.1887	218.9447	110.9589	41.0944	0.0000	0.0000	0.0000	0.0000	103.4142	245.7078	388.2056	(98a)
Space heating requirement - total per year (kWh/year)												1761.1355	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	376.6213	276.1887	218.9447	110.9589	41.0944	0.0000	0.0000	0.0000	0.0000	103.4142	245.7078	388.2056	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1761.1355	
Space heating per m2										(98c) / (4) =		29.3523	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	376.6213	276.1887	218.9447	110.9589	41.0944	0.0000	0.0000	0.0000	0.0000	103.4142	245.7078	388.2056	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	408.0404	299.2294	237.2098	120.2154	44.5227	0.0000	0.0000	0.0000	0.0000	112.0414	266.2056	420.5911	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	205.9424	182.1819	193.8704	171.4475	166.8196	151.0137	149.6379	155.2520	156.5722	173.7363	183.6539	203.8435	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3953	84.9902	84.3332	83.1095	81.4312	79.8000	79.8000	79.8000	79.8000	82.9365	84.7133	85.4807	(217)

Fuel for water heating, kWh/month

	241.1635	214.3562	229.8861	206.2910	204.8594	189.2402	187.5162	194.5514	196.2057	209.4812	216.7945	238.4673 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	19.2325	15.4291	13.8922	10.1780	7.8618	6.4231	7.1718	9.3221	12.1085	15.8871	17.9444	19.7671 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.5460	-29.9699	-44.5592	-51.8887	-57.5186	-54.2780	-53.6372	-49.8784	-43.4848	-35.0891	-22.9507	-17.6496 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-8.7380	-18.6510	-37.5687	-57.1519	-76.2683	-76.8687	-75.9406	-63.9572	-46.4469	-26.8844	-11.7364	-6.8880 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1908.0558	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2528.8129	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	155.2176	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.5501	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3689.5361	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1908.0558	0.2100	400.6917	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2528.8129	0.2100	531.0507	(264)
Space and water heating			931.7424	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	155.2176	0.1443	22.4027	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.4501	0.1339	-64.4474	
PV Unit electricity exported	-507.1000	0.1255	-63.6559	
Total			-128.1034	(269)
Total CO2, kg/year			837.9710	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1908.0558	1.1300	2156.1030	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2528.8129	1.1300	2857.5585	(278)
Space and water heating			5013.6616	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	155.2176	1.5338	238.0780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.4501	1.4947	-719.6171	
PV Unit electricity exported	-507.1000	0.4608	-233.6526	
Total			-953.2697	(283)
Total Primary energy kWh/year			4428.5707	(286)
Target Primary Energy Rate (TPER)			73.8100	(287)

Full SAP Calculation Printout

Property Reference	FLAT 21	**Issued on Date**	17/06/2025
Assessment Reference	Flat 21	**Prop Type Ref**	
Property			

SAP Rating	93 A	**DER**	2.10	**TER**	15.14
Environmental	98 A	**% DER < TER**			86.13
CO_2 Emissions (t/year)	0.11	**DFEE**	46.56	**TFEE**	45.13
Compliance Check	See BREL	**% DFEE < TFEE**			-3.17
% DPER < TPER	73.68	**DPER**	21.06	**TPER**	79.99

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	67.2600	(1b)	x 2.7000	(2b) =	181.6020	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.2600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.6020	(5)

---

2. Ventilation rate

---

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
glazing			13.4000	0.8687	11.6409			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
Doord			2.2000	0.9000	1.9800			(26)
EXPOSED FLOOR			13.4100	0.0900	1.2069			(28b)
External Wall 1	66.2900	16.0400	50.2500	0.1200	6.0300			(29a)
Exposed Internal Wall	19.1700	2.2000	16.9700	0.1200	2.0364			(29a)
External Roof 1	67.2600		67.2600	0.1000	6.7260			(30)
Total net area of external elements Aum(A, m2)			166.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.9962			(33)
Main dwelling								
Party Wall 1			11.7000	0.0000	0.0000			(32)
Party Floor 1			53.8500					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.7000	0.0700	0.6090
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0500	0.0800	0.4840
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.3000	0.0000	0.0000
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
P8 Party Wall - Exposed floor (inverted)	9.1000	0.2400	2.1840
E20 Exposed floor (normal)	9.1000	0.3200	2.9120
E24 Eaves (insulation at ceiling level - inverted)	5.9500	0.2400	1.4280
E14 Flat roof	10.6500	0.0800	0.8520
E10 Eaves (insulation at ceiling level)	13.0000	0.1200	1.5600
E12 Gable (insulation at ceiling level)	8.0000	0.4800	3.8400
P4 Party wall - Roof (insulation at ceiling level)	4.3500	0.2400	1.0440
E2 Other lintels (including other steel lintels)	8.8000	0.2000	1.7600
E3 Sill	6.6000	0.0400	0.2640
E4 Jamb	33.6000	0.0500	1.6800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.5350 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.5312 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.1733	16.9823	16.7913	15.8361	15.6451	14.6900	14.6900	14.4990	15.0721	15.6451	16.0272	16.4092	(38)
Heat transfer coeff	68.7045	68.5135	68.3225	67.3674	67.1764	66.2212	66.2212	66.0302	66.6033	67.1764	67.5584	67.9404	(39)
Average = Sum(39)m / 12 =												67.3196	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0215	1.0186	1.0158	1.0016	0.9988	0.9846	0.9846	0.9817	0.9902	0.9988	1.0044	1.0101	(40)
HLP (average)												1.0009	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1778 (42)
Hot water usage for mixer showers

60.7344	59.8216	58.4916	55.9469	54.0689	51.9747	50.7843	52.1042	53.5511	55.7997	58.3991	60.5017	(42a)

Hot water usage for baths

26.2410	25.8513	25.3025	24.2906	23.5329	22.6927	22.2389	22.7839	23.3772	24.2762	25.3090	26.1523	(42b)

Hot water usage for other uses

36.9330	35.5899	34.2469	32.9039	31.5609	30.2179	30.2179	31.5609	32.9039	34.2469	35.5899	36.9330	(42c)

Average daily hot water use (litres/day) 113.9000 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.9083	121.2629	118.0410	113.1414	109.1627	104.8853	103.2411	106.4490	109.8323	114.3229	119.2981	123.5869	(44)
Energy conte	196.2405	172.6767	181.4247	154.8849	146.9540	128.9687	124.8611	131.8061	135.4342	155.1351	169.9620	193.5072	(45)
Energy content (annual)										Total = Sum(45)m =		1891.8551	
Distribution loss (46)m = 0.15 x (45)m	29.4361	25.9015	27.2137	23.2327	22.0431	19.3453	18.7292	19.7709	20.3151	23.2703	25.4943	29.0261	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.6302	(55)
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	301.6343	267.8711	286.8185	256.8789	252.3478	200.3867	198.6597	205.6047	206.8522	260.5289	271.9560	298.9010	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	301.6343	267.8711	286.8185	256.8789	252.3478	200.3867	198.6597	205.6047	206.8522	260.5289	271.9560	298.9010	(64)
										Total per year (kWh/year) = Sum(64)m =		3008.4397	(64)
12Total per year (kWh/year)												3008	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.1360	97.0540	104.2098	93.9696	92.7483	60.8917	60.1262	62.4354	63.0415	95.4685	98.9827	108.2272	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	96.9641	107.3531	96.9641	100.1963	96.9641	100.1963	96.9641	96.9641	100.1963	96.9641	100.1963	96.9641	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.8195	192.7996	187.8098	177.1871	163.7778	151.1750	142.7555	140.7754	145.7652	156.3879	169.7972	182.4000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	(71)
Water heating gains (Table 5)	146.6882	144.4257	140.0669	130.5134	124.6617	84.5718	80.8148	83.9186	87.5576	128.3179	137.4760	145.4667	(72)
Total internal gains	490.1390	500.2456	480.5080	463.5639	441.0708	391.6102	376.2017	377.3253	389.1863	437.3371	463.1367	480.4981	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

		W/m2	or Table 6b	or Table 6c	Table 6d		
Southeast	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(77)
Southwest	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(79)
Northwest	1.9600	11.2829	0.3000	0.8000	0.7700	3.6781	(81)

Solar gains	73.6857	126.7358	176.6505	224.3179	256.2194	256.5504	246.4331	222.2993	193.1060	140.9450	88.4810	62.9157	(83)
Total gains	563.8248	626.9814	657.1586	687.8818	697.2902	648.1606	622.6348	599.6246	582.2923	578.2822	551.6177	543.4137	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.9844	68.1739	68.3645	69.3338	69.5309	70.5338	70.5338	70.7378	70.1292	69.5309	69.1377	68.7489	
alpha	5.5323	5.5449	5.5576	5.6223	5.6354	5.7023	5.7023	5.7159	5.6753	5.6354	5.6092	5.5833	
util living area	0.9899	0.9807	0.9631	0.9109	0.7990	0.6326	0.4647	0.5014	0.7346	0.9170	0.9785	0.9916	(86)
Living	20.0384	20.2029	20.4155	20.6912	20.8892	20.9773	20.9966	20.9949	20.9477	20.7240	20.3463	20.0146	
Non living	18.9624	19.1713	19.4380	19.7778	19.9941	20.0834	20.0951	20.0968	20.0578	19.8235	19.3628	18.9394	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5081	20.2029	20.4155	20.6912	20.8892	20.9773	20.9966	20.9949	20.9477	20.7240	20.3463	20.1524	(87)
Th 2	20.0655	20.0678	20.0702	20.0820	20.0844	20.0962	20.0962	20.0986	20.0915	20.0844	20.0796	20.0749	(88)
util rest of house	0.9869	0.9750	0.9520	0.8847	0.7462	0.5522	0.3710	0.4059	0.6579	0.8872	0.9711	0.9891	(89)
MIT 2	19.6257	19.1713	19.4380	19.7778	19.9941	20.0834	20.0951	20.0968	20.0578	19.8235	19.3628	19.1441	(90)
Living area fraction									fLA = Living area / (4) =			0.5763	(91)
MIT	20.1342	19.7658	20.0013	20.3042	20.5099	20.5985	20.6146	20.6143	20.5706	20.3424	19.9296	19.7251	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1342	19.7658	20.0013	20.3042	20.5099	20.5985	20.6146	20.6143	20.5706	20.3424	19.9296	19.7251	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9728	0.9510	0.8917	0.7719	0.5977	0.4251	0.4610	0.6999	0.8965	0.9696	0.9879	(94)
Useful gains	556.5672	609.9120	624.9696	613.3837	538.2514	387.4356	264.6609	276.4104	407.5227	518.4436	534.8721	536.8358	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1087.8815	1018.5057	922.4447	768.2695	591.8182	397.2309	265.8542	278.2741	430.9662	654.4616	866.7440	1054.7855	(97)
Space heating kWh	395.2978	274.5749	221.3214	111.5178	39.8537	0.0000	0.0000	0.0000	0.0000	101.1974	238.9477	385.3545	(98a)
Space heating requirement - total per year (kWh/year)												1768.0653	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	395.2978	274.5749	221.3214	111.5178	39.8537	0.0000	0.0000	0.0000	0.0000	101.1974	238.9477	385.3545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1768.0653	
Space heating per m2											(98c) / (4) =	26.2870	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	320.8246 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	395.2978	274.5749	221.3214	111.5178	39.8537	0.0000	0.0000	0.0000	0.0000	101.1974	238.9477	385.3545	(98)
Space heating efficiency (main heating system 1)	320.8246	320.8246	320.8246	320.8246	320.8246	0.0000	0.0000	0.0000	0.0000	320.8246	320.8246	320.8246	(210)
Space heating fuel (main heating system)	123.2130	85.5841	68.9852	34.7597	12.4223	0.0000	0.0000	0.0000	0.0000	31.5429	74.4792	120.1138	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	301.6343	267.8711	286.8185	256.8789	252.3478	200.3867	198.6597	205.6047	206.8522	260.5289	271.9560	298.9010	(64)
Efficiency of water heater												288.2173	(216)
(217)m	288.2173	288.2173	288.2173	288.2173	288.2173	288.2173	288.2173	288.2173	288.2173	288.2173	288.2173	288.2173	(217)
Fuel for water heating, kWh/month	104.6552	92.9407	99.5147	89.1268	87.5547	69.5262	68.9271	71.3367	71.7695	90.3932	94.3580	103.7068	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3278	10.2316	11.3278	10.9624	11.3278	10.9624	11.3278	11.3278	10.9624	11.3278	10.9624	11.3278	(231)
Lighting	20.1472	16.1629	14.5529	10.6620	8.2357	6.7286	7.5129	9.7655	12.6844	16.6426	18.7978	20.7072	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3096	-66.2216	-98.2858	-110.7068	-117.7834	-105.8146	-104.4898	-98.6569	-87.0057	-74.7705	-50.0162	-38.7142	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

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

Annual totals kWh/year		
Space heating fuel - main system 1	551.1002	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.2173	
Water heating fuel used	1043.8096	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	133.3758	(230a)
Total electricity for the above, kWh/year	133.3758	(231)
Electricity for lighting (calculated in Appendix L)	162.5997	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-997.7752	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	893.1100	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	551.1002	0.1562	86.0570	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1043.8096	0.1414	147.6428	(264)
Space and water heating			233.6998	(265)
Pumps, fans and electric keep-hot	133.3758	0.1387	18.5009	(267)
Energy for lighting	162.5997	0.1443	23.4682	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-997.7752	0.1347	-134.3892	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-134.3892	(269)
Total CO2, kg/year			141.2797	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.1000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	551.1002	1.5781	869.6875	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1043.8096	1.5231	1589.7830	(278)
Space and water heating			2459.4705	(279)
Pumps, fans and electric keep-hot	133.3758	1.5128	201.7709	(281)
Energy for lighting	162.5997	1.5338	249.4009	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-997.7752	1.4978	-1494.4752	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1494.4752	(283)
Total Primary energy kWh/year			1416.1671	(286)
Dwelling Primary energy Rate (DPER)			21.0600	(287)

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	67.2600	(1b)	x 2.7000	(2b) =	181.6020	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	181.6020	(5)

---

2. Ventilation rate

---

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1101	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3601	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3061	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3903	0.3826	0.3750	0.3367	0.3291	0.2908	0.2908	0.2832	0.3061	0.3291	0.3444	0.3597	(22b)
Effective ac	0.5762	0.5732	0.5703	0.5567	0.5541	0.5423	0.5423	0.5401	0.5469	0.5541	0.5593	0.5647	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			11.9800	1.1450	13.7176			(27)
EXPOSED FLOOR			13.4100	0.1300	1.7433			(28b)
External Wall 1	66.2900	14.6200	51.6700	0.1800	9.3006			(29a)
Exposed Internal Wall	19.1700	2.2000	16.9700	0.1800	3.0546			(29a)
External Roof 1	67.2600		67.2600	0.1100	7.3986			(30)
Total net area of external elements Aum(A, m2)			166.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.0547			(33)
Main dwelling								
Party Wall 1			11.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.7000	0.0700	0.6090
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0500	0.0200	0.1210
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.3000	0.0000	0.0000
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
P8 Party Wall - Exposed floor (inverted)	9.1000	0.2400	2.1840
E20 Exposed floor (normal)	9.1000	0.3200	2.9120
E24 Eaves (insulation at ceiling level - inverted)	5.9500	0.2400	1.4280
E14 Flat roof	10.6500	0.0800	0.8520
E10 Eaves (insulation at ceiling level)	13.0000	0.0600	0.7800
E12 Gable (insulation at ceiling level)	8.0000	0.0600	0.4800
P4 Party wall - Roof (insulation at ceiling level)	4.3500	0.1200	0.5220
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	6.6000	0.0500	0.3300
E4 Jamb	33.6000	0.0500	1.6800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.1480	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	53.2027	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.5287	34.3515	34.1778	33.3617	33.2091	32.4984	32.4984	32.3667	32.7721	33.2091	33.5179	33.8408	(38)
Heat transfer coeff	87.7314	87.5541	87.3804	86.5644	86.4117	85.7010	85.7010	85.5694	85.9748	86.4117	86.7206	87.0435	(39)
Average = Sum(39)m / 12 =												86.5637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3044	1.3017	1.2991	1.2870	1.2847	1.2742	1.2742	1.2722	1.2782	1.2847	1.2893	1.2941	(40)
HLP (average)												1.2870	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1778	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
60.7344	59.8216	58.4916	55.9469	54.0689	51.9747	50.7843	52.1042	53.5511	55.7997	58.3991	60.5017	(42a)

Hot water usage for baths

26.2410	25.8513	25.3025	24.2906	23.5329	22.6927	22.2389	22.7839	23.3772	24.2762	25.3090	26.1523	(42b)

Hot water usage for other uses

36.9330	35.5899	34.2469	32.9039	31.5609	30.2179	30.2179	31.5609	32.9039	34.2469	35.5899	36.9330	(42c)

Average daily hot water use (litres/day)	113.9000	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.9083	121.2629	118.0410	113.1414	109.1627	104.8853	103.2411	106.4490	109.8323	114.3229	119.2981	123.5869	(44)
Energy conte	196.2405	172.6767	181.4247	154.8849	146.9540	128.9687	124.8611	131.8061	135.4342	155.1351	169.9620	193.5072	(45)
Energy content (annual)										Total = Sum(45)m =		1891.8551	

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

29.4361	25.9015	27.2137	23.2327	22.0431	19.3453	18.7292	19.7709	20.3151	23.2703	25.4943	29.0261	(46)

Water storage loss:

Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

242.8354	214.7624	228.0196	199.9767	193.5489	174.0605	171.4560	178.4010	180.5260	201.7300	215.0538	240.1021	(62)
WWHRS -27.7652	-24.5558	-25.7134	-21.2917	-19.8431	-16.9799	-15.9159	-16.9250	-17.5680	-20.7108	-23.4628	-27.2510	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
215.0702	190.2066	202.3062	178.6850	173.7058	157.0806	155.5401	161.4760	162.9580	181.0192	191.5910	212.8511	(64)
									Total per year (kWh/year) = Sum(64)m =		2182.4897	(64)
12Total per year (kWh/year)												2182	(64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

	102.5259	91.0836	97.5996	87.5727	86.1381	78.9556	78.7922	81.1014	81.1053	88.8583	92.5858	101.6171 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	108.8905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	98.4696	109.0199	98.4696	101.7519	98.4696	101.7519	98.4696	98.4696	101.7519	98.4696	101.7519	98.4696	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	190.8195	192.7996	187.8098	177.1871	163.7778	151.1750	142.7555	140.7754	145.7652	156.3879	169.7972	182.4000	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	33.8891	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	-87.1124	(71)
Water heating gains (Table 5)													
	137.8036	135.5410	131.1823	121.6288	115.7771	109.6605	105.9036	109.0073	112.6463	119.4333	128.5914	136.5821	(72)
Total internal gains													
	485.7599	496.0277	476.1288	459.2349	436.6916	418.2546	402.7958	403.9195	415.8306	432.9580	458.8077	476.1189	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	8.2600	36.7938	0.6300	0.7000	0.7700	92.8810	(77)
Southwest	1.9700	36.7938	0.6300	0.7000	0.7700	22.1520	(79)
Northwest	1.7500	11.2829	0.6300	0.7000	0.7700	6.0344	(81)

Solar gains	121.0674	208.2269	290.2291	368.5318	420.9315	421.4704	404.8514	365.2111	317.2605	231.5706	145.3758	103.3723	(83)
Total gains	606.8272	704.2546	766.3580	827.7667	857.6232	839.7249	807.6473	769.1306	733.0911	664.5285	604.1836	579.4911	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.2402	53.3479	53.4540	53.9579	54.0532	54.5015	54.5015	54.5853	54.3280	54.0532	53.8607	53.6609	
alpha	4.5493	4.5565	4.5636	4.5972	4.6035	4.6334	4.6334	4.6390	4.6219	4.6035	4.5907	4.5774	
util living area													
	0.9893	0.9784	0.9576	0.9029	0.7938	0.6185	0.4595	0.5003	0.7258	0.9204	0.9786	0.9912	(86)
MIT	19.6594	19.8824	20.1727	20.5335	20.8089	20.9547	20.9907	20.9863	20.9048	20.5535	20.0454	19.6211	(87)
Th 2	19.8374	19.8395	19.8415	19.8510	19.8528	19.8611	19.8611	19.8627	19.8579	19.8528	19.8492	19.8454	(88)
util rest of house													
	0.9859	0.9716	0.9441	0.8722	0.7326	0.5226	0.3444	0.3824	0.6351	0.8883	0.9707	0.9884	(89)
MIT 2	18.3160	18.5981	18.9609	19.4000	19.7008	19.8370	19.8584	19.8583	19.7991	19.4351	18.8138	18.2730	(90)
Living area fraction									fLA = Living area / (4) =			0.5763	(91)
MIT	19.0902	19.3382	19.6592	20.0532	20.3394	20.4811	20.5109	20.5083	20.4363	20.0796	19.5235	19.0498	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0902	19.3382	19.6592	20.0532	20.3394	20.4811	20.5109	20.5083	20.4363	20.0796	19.5235	19.0498	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9679	0.9415	0.8782	0.7603	0.5763	0.4108	0.4504	0.6835	0.8956	0.9679	0.9858	(94)
Useful gains	596.4966	681.6833	721.5473	726.9796	652.0506	483.9576	331.8143	346.4335	501.0464	595.1634	584.7693	571.2707	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1297.5615	1264.1260	1149.8594	965.4712	746.5438	504.0147	335.1695	351.5464	544.7600	819.1493	1077.3761	1292.5819	(97)
Space heating kWh													
	521.5923	391.4015	318.6642	171.7140	70.3030	0.0000	0.0000	0.0000	0.0000	166.6455	354.6769	536.6556	(98a)
Space heating requirement - total per year (kWh/year)												2531.6529	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	521.5923	391.4015	318.6642	171.7140	70.3030	0.0000	0.0000	0.0000	0.0000	166.6455	354.6769	536.6556	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2531.6529	
Space heating per m2											(98c) / (4) =	37.6398	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	521.5923	391.4015	318.6642	171.7140	70.3030	0.0000	0.0000	0.0000	0.0000	166.6455	354.6769	536.6556	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	565.1054	424.0536	345.2483	186.0390	76.1679	0.0000	0.0000	0.0000	0.0000	180.5477	384.2653	581.4253	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

215.0702	190.2066	202.3062	178.6850	173.7058	157.0806	155.5401	161.4760	162.9580	181.0192	191.5910	212.8511	(64)

Efficiency of water heater

											79.8000	(216)
(217)m	85.9693	85.6412	85.0741	83.9706	82.2003	79.8000	79.8000	79.8000	79.8000	83.8747	85.4211	86.0441	(217)

Fuel for water heating, kWh/month

250.1709	222.0970	237.8000	212.7947	211.3201	196.8429	194.9124	202.3509	204.2080	215.8211	224.2900	247.3744	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.4600	16.4138	14.7788	10.8276	8.3635	6.8331	7.6295	9.9171	12.8814	16.9010	19.0897	21.0287	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-22.9209	-33.3779	-49.5429	-57.5886	-63.7396	-60.1015	-59.3751	-55.2488	-48.2342	-39.0141	-25.5777	-19.6949	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

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

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

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

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-9.9064	-21.1262	-42.5224	-64.6460	-86.2356	-86.9139	-85.8815	-72.3610	-52.5792	-30.4583	-13.3065	-7.8118	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

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

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

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

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

Annual totals kWh/year

Space heating fuel - main system 1	2742.8525	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2619.9822	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	165.1242	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1108.1647	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4505.7943	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2742.8525	0.2100	575.9990	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2619.9822	0.2100	550.1963	(264)
Space and water heating			1126.1953	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	165.1242	0.1443	23.8325	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-534.4161	0.1339	-71.5591	
PV Unit electricity exported	-573.7486	0.1255	-72.0305	
Total			-143.5896	(269)
Total CO2, kg/year			1018.3675	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2742.8525	1.1300	3099.4233	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2619.9822	1.1300	2960.5799	(278)
Space and water heating			6060.0033	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	165.1242	1.5338	253.2730	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-534.4161	1.4948	-798.8657	
PV Unit electricity exported	-573.7486	0.4608	-264.3920	
Total			-1063.2577	(283)
Total Primary energy kWh/year			5380.1194	(286)
Target Primary Energy Rate (TPER)			79.9900	(287)

Full SAP Calculation Printout

Property Reference	FLAT 2	**Issued on Date**	17/06/2025
Assessment Reference	Flat 2	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	1.99	**TER**	16.63
Environmental	99 A	**% DER < TER**			88.03
CO_2 Emissions (t/year)	0.08	**DFEE**	42.22	**TFEE**	46.50
Compliance Check	See BREL	**% DFEE < TFEE**			9.22
% DPER < TPER	77.45	**DPER**	19.90	**TPER**	88.23

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.7200	(1b)	x 2.7000	(2b) =	145.0440	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.7200					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	145.0440	(5)

---

2. Ventilation rate

---

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			12.3200	0.8687	10.7027			(27)
DOOR TO CORRIDOR			2.0000	0.9000	1.8000			(26)
OPAQUE			3.9600	0.9000	3.5640			(26)
GROUND FLOOR			53.7200	0.0900	4.8348			(28a)
External Wall	42.8500	16.2800	26.5700	0.1200	3.1884			(29a)
Exposed - Int. Wall to corrido	27.5000	2.0000	25.5000	0.1200	3.0600			(29a)
basement Wall	4.1400		4.1400	0.1200	0.4968			(29a)
Total net area of external elements Aum(A, m2)			128.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6467			(33)
Main dwelling								
Party Wall 1			9.8300	0.0000	0.0000			(32)
Party Ceiling 1			53.7200					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	14.7300	0.0700	1.0311
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1700	0.0000	0.0000
E16 Corner (normal)	9.7000	0.0900	0.8730
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	3.8000	0.0800	0.3040
P1 Party wall - Ground floor	5.1700	0.2200	1.1374
E5 Ground floor (normal)	26.0000	0.1300	3.3800
E2 Other lintels (including other steel lintels)	8.4000	0.2000	1.6800
E3 Sill	5.6000	0.0400	0.2240
E4 Jamb	34.8000	0.0500	1.7400
E22 Basement floor	5.1700	0.0700	0.3619
P6 Party wall - Ground floor (inverted)	5.1700	0.0700	0.3619

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.8503 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.4970 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.7162	13.5636	13.4110	12.6482	12.4956	11.7328	11.7328	11.5802	12.0379	12.4956	12.8008	13.1059	(38)
Heat transfer coeff	52.2132	52.0606	51.9080	51.1452	50.9926	50.2298	50.2298	50.0772	50.5349	50.9926	51.2978	51.6029	(39)

Average = Sum(39)m / 12 = 51.1071

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9691	0.9663	0.9521	0.9492	0.9350	0.9350	0.9322	0.9407	0.9492	0.9549	0.9606	(40)
HLP (average)												0.9514	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7998 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	54.3957	53.5782	52.3870	50.1079	48.4259	46.5502	45.4841	46.6663	47.9622	49.9761	52.3042	54.1873	(42a)
Hot water usage for baths	23.5152	23.1659	22.6741	21.7673	21.0884	20.3355	19.9288	20.4172	20.9489	21.7545	22.6800	23.4357	(42b)
Hot water usage for other uses	33.0614	31.8592	30.6569	29.4547	28.2525	27.0502	27.0502	28.2525	29.4547	30.6569	31.8592	33.0614	(42c)

Average daily hot water use (litres/day) 102.0091 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.9722	108.6033	105.7181	101.3299	97.7668	93.9359	92.4631	95.3359	98.3657	102.3875	106.8433	110.6843	(44)
Energy conte	175.7529	154.6497	162.4848	138.7156	131.6128	115.5052	111.8261	118.0457	121.2948	138.9389	152.2179	173.3049	(45)
Energy content (annual)										Total = Sum(45)m =		1694.3494	
Distribution loss (46)m = 0.15 x (45)m	26.3629	23.1975	24.3727	20.8073	19.7419	17.3258	16.7739	17.7069	18.1942	20.8408	22.8327	25.9957	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	281.1467	249.8441	267.8786	240.7096	237.0066	186.9232	185.6247	191.8443	192.7128	244.3327	254.2119	278.6987	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	281.1467	249.8441	267.8786	240.7096	237.0066	186.9232	185.6247	191.8443	192.7128	244.3327	254.2119	278.6987	(64)
										Total per year (kWh/year) = Sum(64)m =		2810.9340	(64)
12Total per year (kWh/year)												2811	(64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

	102.3239	91.0601	97.9123	88.5933	87.6474	56.4151	55.7921	57.8601	58.3401	90.0833	93.0828	101.5100	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.1285	87.6065	79.1285	81.7661	79.1285	81.7661	79.1285	79.1285	81.7661	79.1285	81.7661	79.1285	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.8811	158.5090	154.4066	145.6732	134.6489	124.2876	117.3656	115.7376	119.8400	128.5734	139.5977	149.9590	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	(71)
Water heating gains (Table 5)	137.5322	135.5060	131.6025	123.0463	117.8056	78.3543	74.9894	77.7690	81.0279	121.0797	129.2817	136.4381	(72)
Total internal gains	423.5382	431.6180	415.1341	400.4821	381.5794	334.4044	321.4799	322.6316	332.6305	378.7780	400.6420	415.5221	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(79)
Northwest	3.0800	11.2829	0.3000	0.8000	0.7700	5.7799	(81)

Solar gains	62.3245	108.0815	152.9813	198.0987	229.6887	231.4594	221.7235	197.6312	168.5234	120.8281	75.0000	53.1106	(83)
Total gains	485.8627	539.6996	568.1154	598.5808	611.2681	565.8638	543.2034	520.2628	501.1539	499.6060	475.6420	468.6327	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.4485	71.6579	71.8685	72.9405	73.1587	74.2698	74.2698	74.4961	73.8213	73.1587	72.7235	72.2935	
alpha	5.7632	5.7772	5.7912	5.8627	5.8772	5.9513	5.9513	5.9664	5.9214	5.8772	5.8482	5.8196	
util living area	0.9845	0.9705	0.9436	0.8681	0.7284	0.5595	0.4057	0.4408	0.6689	0.8788	0.9667	0.9870	(86)
Living	20.1882	20.3513	20.5528	20.7946	20.9400	20.9898	20.9987	20.9979	20.9720	20.8110	20.4761	20.1642	
Non living	19.1828	19.3880	19.6368	19.9276	20.0790	20.1323	20.1374	20.1395	20.1157	19.9533	19.5552	19.1601	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5847	20.3513	20.5528	20.7946	20.9400	20.9898	20.9987	20.9979	20.9720	20.8110	20.4761	20.2811	(87)
Th 2	20.1068	20.1092	20.1115	20.1235	20.1259	20.1378	20.1378	20.1402	20.1330	20.1259	20.1211	20.1163	(88)
util rest of house	0.9800	0.9624	0.9283	0.8358	0.6740	0.4879	0.3269	0.3595	0.5954	0.8423	0.9562	0.9832	(89)
MIT 2	19.7384	19.3880	19.6368	19.9276	20.0790	20.1323	20.1374	20.1395	20.1157	19.9533	19.5552	19.3324	(90)
Living area fraction									fLA = Living area / (4) =			0.5465	(91)
MIT	20.2009	19.9144	20.1374	20.4015	20.5496	20.6010	20.6081	20.6087	20.5837	20.4220	20.0585	19.8509	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2009	19.9144	20.1374	20.4015	20.5496	20.6010	20.6081	20.6087	20.5837	20.4220	20.0585	19.8509	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9806	0.9604	0.9288	0.8467	0.7012	0.5267	0.3700	0.4040	0.6345	0.8557	0.9553	0.9819	(94)
Useful gains	476.4211	518.3041	527.6499	506.8426	428.6048	298.0668	200.9832	210.1860	317.9839	427.4905	454.3901	460.1424	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	830.2385	781.6610	707.8926	588.2445	451.2622	301.4274	201.3282	210.7583	327.6550	500.8521	664.7419	807.6329	(97)
Space heating kWh	263.2402	176.9758	134.1006	58.6094	16.8571	0.0000	0.0000	0.0000	0.0000	54.5810	151.4533	258.5329	(98a)
Space heating requirement - total per year (kWh/year)												1114.3504	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	263.2402	176.9758	134.1006	58.6094	16.8571	0.0000	0.0000	0.0000	0.0000	54.5810	151.4533	258.5329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.3504	
Space heating per m2											(98c) / (4) =	20.7437	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	290.5349	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	263.2402	176.9758	134.1006	58.6094	16.8571	0.0000	0.0000	0.0000	0.0000	54.5810	151.4533	258.5329	(98)
Space heating efficiency (main heating system 1)	290.5349	290.5349	290.5349	290.5349	0.0000	0.0000	0.0000	0.0000	290.5349	290.5349	290.5349	290.5349	(210)
Space heating fuel (main heating system)	90.6054	60.9138	46.1565	20.1729	5.8021	0.0000	0.0000	0.0000	0.0000	18.7864	52.1291	88.9852	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	281.1467	249.8441	267.8786	240.7096	237.0066	186.9232	185.6247	191.8443	192.7128	244.3327	254.2119	278.6987	(64)
Efficiency of water heater												288.6897	(216)
(217)m	288.6897	288.6897	288.6897	288.6897	288.6897	288.6897	288.6897	288.6897	288.6897	288.6897	288.6897	288.6897	(217)
Fuel for water heating, kWh/month	97.3872	86.5442	92.7912	83.3801	82.0974	64.7488	64.2990	66.4535	66.7543	84.6351	88.0571	96.5392	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0474	8.1719	9.0474	8.7556	9.0474	8.7556	9.0474	9.0474	8.7556	9.0474	8.7556	9.0474	(231)
Lighting	16.4413	13.1898	11.8760	8.7009	6.7208	5.4909	6.1309	7.9692	10.3512	13.5814	15.3401	16.8983	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.6418	-62.7684	-91.5385	-101.2918	-107.0833	-96.2218	-95.0913	-90.4455	-80.6436	-70.1711	-47.8255	-37.4154	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												383.5513	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	288.6897	
Water heating fuel used	973.6870	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	106.5261	(230a)
Total electricity for the above, kWh/year	106.5261	(231)
Electricity for lighting (calculated in Appendix L)	132.6910	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-924.1381	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	672.3174	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	383.5513	0.1568	60.1585	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	973.6870	0.1414	137.7152	(264)
Space and water heating			197.8736	(265)
Pumps, fans and electric keep-hot	106.5261	0.1387	14.7765	(267)
Energy for lighting	132.6910	0.1443	19.1514	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-924.1381	0.1350	-124.7155	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-124.7155	(269)
Total CO2, kg/year			107.0861	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	383.5513	1.5806	606.2552	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	973.6870	1.5230	1482.9495	(278)
Space and water heating			2089.2047	(279)
Pumps, fans and electric keep-hot	106.5261	1.5128	161.1527	(281)
Energy for lighting	132.6910	1.5338	203.5259	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-924.1381	1.4988	-1385.0962	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1385.0962	(283)
Total Primary energy kWh/year			1068.7870	(286)
Dwelling Primary energy Rate (DPER)			19.9000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.7200	(1b)	x 2.7000	(2b) =	145.0440	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.7200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		145.0440	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1379	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3879	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3297 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4204	0.4121	0.4039	0.3627	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874	(22b)
Effective ac	0.5884	0.5849	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5750	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			5.9600	1.0000	5.9600			(26)
TER Opening Type			7.4700	1.1450	8.5534			(27)
GROUND FLOOR			53.7200	0.1300	6.9836			(28a)
External Wall	42.8500	11.4300	31.4200	0.1800	5.6556			(29a)
Exposed - Int. Wall to corrido	27.5000	2.0000	25.5000	0.1800	4.5900			(29a)
basement Wall	4.1400		4.1400	0.1800	0.7452			(29a)
Total net area of external elements Aum(A, m2)			128.2100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.4878			(33)
Main dwelling								
Party Wall 1			9.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	14.7300	0.0700	1.0311
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1700	0.0000	0.0000
E16 Corner (normal)	9.7000	0.0900	0.8730
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	3.8000	0.0600	0.2280
P1 Party wall - Ground floor	5.1700	0.0800	0.4136
E5 Ground floor (normal)	26.0000	0.1600	4.1600
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	34.8000	0.0500	1.7400
E22 Basement floor	5.1700	0.0700	0.3619
P6 Party wall - Ground floor (inverted)	5.1700	0.0700	0.3619

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.6265 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.1143 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.1615	27.9972	27.8363	27.0802	26.9387	26.2802	26.2802	26.1582	26.5338	26.9387	27.2249	27.5241	(38)
Heat transfer coeff	70.2758	70.1116	69.9506	69.1945	69.0530	68.3945	68.3945	68.2726	68.6482	69.0530	69.3392	69.6384	(39)
Average = Sum(39)m / 12 =												69.1938	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3082	1.3051	1.3021	1.2881	1.2854	1.2732	1.2732	1.2709	1.2779	1.2854	1.2908	1.2963	(40)
HLP (average)												1.2880	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7998 (42)

Hot water usage for mixer showers

54.3957	53.5782	52.3870	50.1079	48.4259	46.5502	45.4841	46.6663	47.9622	49.9761	52.3042	54.1873	(42a)

Hot water usage for baths

23.5152	23.1659	22.6741	21.7673	21.0884	20.3355	19.9288	20.4172	20.9489	21.7545	22.6800	23.4357	(42b)

Hot water usage for other uses

33.0614	31.8592	30.6569	29.4547	28.2525	27.0502	27.0502	28.2525	29.4547	30.6569	31.8592	33.0614	(42c)

Average daily hot water use (litres/day) 102.0091 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.9722	108.6033	105.7181	101.3299	97.7668	93.9359	92.4631	95.3359	98.3657	102.3875	106.8433	110.6843	(44)
Energy conte	175.7529	154.6497	162.4848	138.7156	131.6128	115.5052	111.8261	118.0457	121.2948	138.9389	152.2179	173.3049	(45)
Energy content (annual)											Total = Sum(45)m =	1694.3494	
Distribution loss (46)m = 0.15 x (45)m	26.3629	23.1975	24.3727	20.8073	19.7419	17.3258	16.7739	17.7069	18.1942	20.8408	22.8327	25.9957	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	222.3478	196.7354	209.0797	183.8075	178.2078	160.5970	158.4210	164.6406	166.3866	185.5338	197.3097	219.8998	(62)
WWHRS	-24.8674	-21.9930	-23.0298	-19.0696	-17.7721	-15.2077	-14.2548	-15.1586	-15.7345	-18.5493	-21.0141	-24.4069	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.4804	174.7424	186.0499	164.7379	160.4356	145.3893	144.1662	149.4821	150.6521	166.9845	176.2957	195.4929	(64)
										Total per year (kWh/year) = Sum(64)m =		2011.9090	(64)
12Total per year (kWh/year)												2012	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.7138	85.0896	91.3021	82.1964	81.0372	74.4790	74.4581	76.5261	76.4040	83.4731	86.6859	94.8998	(65)

---

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	89.9883	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	85.0157	94.1245	85.0157	87.8496	85.0157	87.8496	85.0157	85.0157	87.8496	85.0157	87.8496	85.0157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.8811	158.5090	154.4066	145.6732	134.6489	124.2876	117.3656	115.7376	119.8400	128.5734	139.5977	149.9590	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	31.9988	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	-71.9907	(71)
Water heating gains (Table 5)													
	128.6475	126.6214	122.7179	114.1617	108.9210	103.4430	100.0781	102.8577	106.1167	112.1950	120.3971	127.5535	(72)
Total internal gains													
	423.5408	432.2514	415.1367	400.6810	381.5821	365.5766	352.4559	353.6075	363.8027	378.7806	400.8409	415.5248	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.6000	36.7938	0.6300	0.7000	0.7700	62.9702	(79)
Northwest	1.8700	11.2829	0.6300	0.7000	0.7700	6.4482	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	69.4183	120.3869	170.4077	220.6791	255.8827	257.8608	247.0121	220.1633	187.7251	134.5871	83.5372	59.1552	(83)
Total gains	492.9591	552.6384	585.5444	621.3601	637.4648	623.4374	599.4680	573.7708	551.5278	513.3677	484.3781	474.6800	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.0845	53.2089	53.3313	53.9140	54.0245	54.5447	54.5447	54.6421	54.3431	54.0245	53.8015	53.5704	
alpha	4.5390	4.5473	4.5554	4.5943	4.6016	4.6363	4.6363	4.6428	4.6229	4.6016	4.5868	4.5714	
util living area													
	0.9886	0.9798	0.9637	0.9193	0.8245	0.6551	0.4915	0.5317	0.7545	0.9282	0.9783	0.9903	(86)
MIT	19.6689	19.8602	20.1262	20.4821	20.7729	20.9428	20.9878	20.9825	20.8878	20.5294	20.0468	19.6397	(87)
Th 2	19.8344	19.8368	19.8392	19.8502	19.8523	19.8619	19.8619	19.8637	19.8582	19.8523	19.8481	19.8437	(88)
util rest of house													
	0.9850	0.9734	0.9518	0.8921	0.7669	0.5573	0.3698	0.4082	0.6653	0.8983	0.9703	0.9872	(89)
MIT 2	18.3258	18.5686	18.9029	19.3422	19.6673	19.8307	19.8583	19.8580	19.7872	19.4082	18.8147	18.2954	(90)
Living area fraction										fLA = Living area / (4) =		0.5465	(91)
MIT	19.0599	19.2745	19.5715	19.9652	20.2715	20.4385	20.4756	20.4726	20.3887	20.0210	19.4881	19.0301	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0599	19.2745	19.5715	19.9652	20.2715	20.4385	20.4756	20.4726	20.3887	20.0210	19.4881	19.0301	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9818	0.9695	0.9484	0.8952	0.7897	0.6087	0.4365	0.4758	0.7095	0.9035	0.9672	0.9843	(94)
Useful gains	483.9758	535.7939	555.3585	556.2500	503.4229	379.5161	261.6728	273.0000	391.2848	463.8115	468.4687	467.2398	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.2613	1007.8180	914.3598	765.6513	591.8912	399.3221	265.0699	278.0452	431.7085	650.5469	858.9795	1032.7467	(97)
Space heating kWh													
	411.6444	317.2002	267.0969	150.7689	65.8205	0.0000	0.0000	0.0000	0.0000	138.9312	281.1678	420.7372	(98a)
Space heating requirement - total per year (kWh/year)												2053.3670	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	411.6444	317.2002	267.0969	150.7689	65.8205	0.0000	0.0000	0.0000	0.0000	138.9312	281.1678	420.7372	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2053.3670	
Space heating per m2											(98c) / (4) =	38.2235	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	411.6444	317.2002	267.0969	150.7689	65.8205	0.0000	0.0000	0.0000	0.0000	138.9312	281.1678	420.7372	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	445.9853	343.6622	289.3791	163.3466	71.3114	0.0000	0.0000	0.0000	0.0000	150.5213	304.6238	455.8366	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	197.4804	174.7424	186.0499	164.7379	160.4356	145.3893	144.1662	149.4821	150.6521	166.9845	176.2957	195.4929	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6676	85.3796	84.8701	83.8616	82.2243	79.8000	79.8000	79.8000	79.8000	83.6503	85.1012	85.7326	(217)

Fuel for water heating, kWh/month

	230.5193	204.6653	219.2173	196.4402	195.1194	182.1921	180.6594	187.3209	188.7871	199.6222	207.1600	228.0264 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.6646	14.1712	12.7596	9.3482	7.2208	5.8995	6.5871	8.5621	11.1214	14.5918	16.4815	18.1555 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.4697	-26.9803	-40.1740	-46.8595	-52.0189	-49.1258	-48.5574	-45.1251	-39.2874	-31.6344	-20.6491	-15.8625 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.7492	-16.5516	-33.3578	-50.7682	-67.7650	-68.2941	-67.4578	-56.7958	-41.2314	-23.8525	-10.4075	-6.1069 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2224.6663	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2419.7296	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.5633	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-885.0819	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8774	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2224.6663	0.2100	467.1799	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2419.7296	0.2100	508.1432	(264)
Space and water heating			975.3232	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.5633	0.1443	20.5763	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-434.7441	0.1338	-58.1794	
PV Unit electricity exported	-450.3378	0.1255	-56.5268	
Total			-114.7062	(269)
Total CO2, kg/year			893.1225	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.6300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2224.6663	1.1300	2513.8730	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2419.7296	1.1300	2734.2945	(278)
Space and water heating			5248.1674	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.5633	1.5338	218.6684	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-434.7441	1.4945	-649.7463	
PV Unit electricity exported	-450.3378	0.4607	-207.4847	
Total			-857.2310	(283)
Total Primary energy kWh/year			4739.7056	(286)
Target Primary Energy Rate (TPER)			88.2300	(287)

Full SAP Calculation Printout

Property Reference	FLAT 3	**Issued on Date**	17/06/2025
Assessment Reference	Flat 3	**Prop Type Ref**	
Property			

SAP Rating	96 A	**DER**	1.43	**TER**	14.80
Environmental	99 A	**% DER < TER**			90.34
CO_2 Emissions (t/year)	0.06	**DFEE**	34.71	**TFEE**	37.66
Compliance Check	See BREL	**% DFEE < TFEE**			7.84
% DPER < TPER	82.16	**DPER**	13.98	**TPER**	78.36

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			8.3600	0.8687	7.2625			(27)
Door to Corridor			2.0000	0.9000	1.8000			(26)
opaque			2.6400	0.9000	2.3760			(26)
Ground Floor			52.4000	0.0900	4.7160			(28a)
External Wall 1	29.1400	11.0000	18.1400	0.1200	2.1768			(29a)
Int Exposeed wall	23.2300	2.0000	21.2300	0.1200	2.5476			(29a)
Total net area of external elements Aum(A, m2)			104.7700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.8789			(33)
Main dwelling								
Party Wall 1			30.7800	0.0000	0.0000			(32)
Party Ceiling 1			52.4300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			

E5 Ground floor (normal)	19.4000	0.1300	2.5220	
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0700	0.8750	
E16 Corner (normal)	8.1000	0.0900	0.7290	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E18 Party wall between dwellings	2.7000	0.0600	0.1620	
E25 Staggered party wall between dwellings	8.1000	0.0800	0.6480	
P1 Party wall - Ground floor	6.2000	0.2200	1.3640	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4000	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9000	0.0800	0.4720	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.0000	0.0500	1.3000	
P6 Party wall - Ground floor (inverted)	5.2000	0.0700	0.3640	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.5450 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4239 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	43.1334	42.9977	42.8620	42.1836	42.0479	41.3695	41.3695	41.2338	41.6408	42.0479	42.3193	42.5907	(39)

Average = Sum(39)m / 12 = 42.1497

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8232	0.8206	0.8180	0.8050	0.8024	0.7895	0.7895	0.7869	0.7947	0.8024	0.8076	0.8128	(40)
HLP (average)												0.8044	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.6302	(55)
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(64)
										Total per year (kWh/year) = Sum(64)m =		2790.6131	(64)
12Total per year (kWh/year)												2791	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	101.6230	90.4434	97.2643	88.0402	87.1225	55.9545	55.3462	57.3894	57.8564	89.5292	92.4758	100.8188	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	136.5901	134.5883	130.7316	122.2780	117.1002	77.7146	74.3900	77.1363	80.3561	120.3349	128.4386	135.5092	(72)
Total internal gains	420.2667	428.5146	411.9877	397.6843	379.0290	332.2011	319.4120	320.5658	330.4920	376.3206	397.9018	412.4146	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	471.4261	515.6580	531.2212	545.4204	544.5057	496.4812	477.7955	465.7140	459.5966	472.6326	459.1790	456.1964	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.3636	84.6298	84.8977	86.2631	86.5415	87.9608	87.9608	88.2502	87.3875	86.5415	85.9866	85.4387	
alpha	6.6242	6.6420	6.6598	6.7509	6.7694	6.8641	6.8641	6.8833	6.8258	6.7694	6.7324	6.6959	
util living area	0.9783	0.9597	0.9270	0.8403	0.6949	0.5299	0.3807	0.4068	0.6154	0.8350	0.9514	0.9816	(86)
Living	20.4363	20.5704	20.7190	20.8863	20.9723	20.9964	20.9997	20.9995	20.9902	20.9069	20.6698	20.4165	
Non living	19.5948	19.7618	19.9427	20.1421	20.2297	20.2604	20.2623	20.2645	20.2520	20.1687	19.8949	19.5775	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7116	20.5704	20.7190	20.8863	20.9723	20.9964	20.9997	20.9995	20.9902	20.9069	20.6698	20.4981	(87)
Th 2	20.2333	20.2355	20.2378	20.2490	20.2512	20.2624	20.2624	20.2647	20.2580	20.2512	20.2467	20.2423	(88)
util rest of house	0.9726	0.9497	0.9097	0.8078	0.6463	0.4704	0.3170	0.3420	0.5533	0.7963	0.9380	0.9767	(89)
MIT 2	19.9788	19.7618	19.9427	20.1421	20.2297	20.2604	20.2623	20.2645	20.2520	20.1687	19.8949	19.6973	(90)
Living area fraction									fLA = Living area / (4) =			0.4943	(91)
MIT	20.3410	20.1615	20.3264	20.5099	20.5968	20.6242	20.6268	20.6278	20.6169	20.5336	20.2779	20.0931	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3410	20.1615	20.3264	20.5099	20.5968	20.6242	20.6268	20.6278	20.6169	20.5336	20.2779	20.0931	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9735	0.9487	0.9119	0.8196	0.6691	0.4998	0.3485	0.3741	0.5837	0.8116	0.9386	0.9756	(94)
Useful gains	458.9273	489.1842	484.3995	447.0444	364.3391	248.1178	166.5074	174.2019	268.2696	383.6048	430.9882	445.0714	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	691.9034	656.2080	592.6280	489.7492	374.0902	249.2173	166.5859	174.3279	271.3675	417.6851	557.6799	676.8989	(97)
Space heating kWh	173.3342	112.2400	80.5220	30.7474	7.2548	0.0000	0.0000	0.0000	0.0000	25.3558	91.2180	172.4797	(98a)
Space heating requirement - total per year (kWh/year)												693.1520	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	173.3342	112.2400	80.5220	30.7474	7.2548	0.0000	0.0000	0.0000	0.0000	25.3558	91.2180	172.4797	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												693.1520	
Space heating per m2											(98c) / (4) =	13.2281	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	268.0872	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	173.3342	112.2400	80.5220	30.7474	7.2548	0.0000	0.0000	0.0000	0.0000	25.3558	91.2180	172.4797	(98)
Space heating efficiency (main heating system 1)	268.0872	268.0872	268.0872	268.0872	0.0000	0.0000	0.0000	0.0000	268.0872	268.0872	268.0872	268.0872	(210)
Space heating fuel (main heating system)	64.6559	41.8670	30.0357	11.4692	2.7061	0.0000	0.0000	0.0000	0.0000	9.4580	34.0255	64.3372	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(64)
Efficiency of water heater												283.8300	(216)
(217)m	283.8300	283.8300	283.8300	283.8300	283.8300	283.8300	283.8300	283.8300	283.8300	283.8300	283.8300	283.8300	(217)
Fuel for water heating, kWh/month	98.3119	87.3725	93.6934	84.2215	82.9469	65.3694	64.9275	67.0925	67.3847	85.4971	88.9216	97.4598	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.8251	7.9711	8.8251	8.5404	8.8251	8.5404	8.8251	8.8251	8.5404	8.8251	8.5404	8.8251	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.7454	-72.3893	-102.6642	-110.6562	-115.3786	-103.0535	-101.9109	-98.2426	-89.4582	-79.7469	-56.0117	-44.6343	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												258.5547	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	283.8300	
Water heating fuel used	983.1988	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9086	(230a)
Total electricity for the above, kWh/year	103.9086	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1025.8918	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	455.2648	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	258.5547	0.1576	40.7415	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	983.1988	0.1414	139.0595	(264)
Space and water heating			179.8010	(265)
Pumps, fans and electric keep-hot	103.9086	0.1387	14.4134	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1025.8918	0.1354	-138.9526	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-138.9526	(269)
Total CO2, kg/year			74.8179	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	258.5547	1.5833	409.3743	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	983.1988	1.5230	1497.4325	(278)
Space and water heating			1906.8068	(279)
Pumps, fans and electric keep-hot	103.9086	1.5128	157.1929	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1025.8918	1.5006	-1539.4970	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1539.4970	(283)
Total Primary energy kWh/year			732.3288	(286)
Dwelling Primary energy Rate (DPER)			13.9800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.4800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3033 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.6400	1.0000	4.6400			(26)
TER Opening Type			8.3600	1.1450	9.5725			(27)
Ground Floor			52.4000	0.1300	6.8120			(28a)
External Wall 1	29.1400	11.0000	18.1400	0.1800	3.2652			(29a)
Int Exposeed wall	23.2300	2.0000	21.2300	0.1800	3.8214			(29a)
Total net area of external elements Aum(A, m2)			104.7700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1111			(33)
Main dwelling								
Party Wall 1			30.7800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	19.4000	0.1600	3.1040
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0700	0.8750
E16 Corner (normal)	8.1000	0.0900	0.7290
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E18 Party wall between dwellings	2.7000	0.0600	0.1620
E25 Staggered party wall between dwellings	8.1000	0.0600	0.4860
P1 Party wall - Ground floor	6.2000	0.0800	0.4960
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.9000	0.0200	0.1180
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.0000	0.0500	1.3000
P6 Party wall - Ground floor (inverted)	5.2000	0.0700	0.3640

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8810 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.9921 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff	62.8274	62.6919	62.5590	61.9348	61.8181	61.2745	61.2745	61.1738	61.4839	61.8181	62.0543	62.3013	(39)
Average = Sum(39)m / 12 =												61.9343	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1990	1.1964	1.1939	1.1820	1.1797	1.1694	1.1694	1.1674	1.1734	1.1797	1.1842	1.1890	(40)
HLP (average)												1.1820	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	220.2399	194.8806	207.1310	182.1438	176.6293	159.2118	157.0799	163.2249	164.9319	183.8674	195.4841	217.8213	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	195.6706	173.1514	184.3773	163.3029	159.0703	144.1864	142.9960	148.2480	149.3860	165.5405	174.7220	193.7070	(64)
										Total per year (kWh/year) = Sum(64)m =		1994.3584	(64)
12Total per year (kWh/year)												1994	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.0129	84.4729	90.6542	81.6433	80.5124	74.0184	74.0122	76.0554	75.9203	82.9190	86.0789	94.2087	(65)

---

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)													
	127.7055	125.7037	121.8470	113.3934	108.2156	102.8033	99.4787	102.2250	105.4448	111.4503	119.5540	126.6246	(72)
Total internal gains													
	414.3821	422.6299	406.1031	391.7997	373.1443	357.2898	344.5007	345.6545	355.5807	370.4359	392.0172	406.5300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.6300	0.7000	0.7700	24.7383	(77)
Southwest	6.1600	36.7938	0.6300	0.7000	0.7700	69.2672	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	94.0055	160.1261	219.0915	271.4650	304.0634	301.8646	291.0297	266.7098	237.2298	176.9734	112.5969	80.4491	(83)
Total gains	508.3875	582.7560	625.1946	663.2647	677.2078	659.1544	635.5304	612.3643	592.8104	547.4094	504.6140	486.9791	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.9188	58.0441	58.1673	58.7535	58.8645	59.3867	59.3867	59.4844	59.1845	58.8645	58.6404	58.4079	
alpha	4.8613	4.8696	4.8778	4.9169	4.9243	4.9591	4.9591	4.9656	4.9456	4.9243	4.9094	4.8939	
util living area													
	0.9846	0.9697	0.9430	0.8774	0.7567	0.5757	0.4207	0.4543	0.6706	0.8905	0.9688	0.9872	(86)
MIT	19.8875	20.0988	20.3556	20.6594	20.8730	20.9742	20.9955	20.9934	20.9456	20.6837	20.2403	19.8505	(87)
Th 2	19.9208	19.9229	19.9249	19.9345	19.9362	19.9446	19.9446	19.9461	19.9414	19.9362	19.9326	19.9288	(88)
util rest of house													
	0.9799	0.9608	0.9265	0.8432	0.6957	0.4889	0.3217	0.3529	0.5847	0.8524	0.9582	0.9833	(89)
MIT 2	18.6634	18.9288	19.2461	19.6104	19.8369	19.9310	19.9433	19.9440	19.9087	19.6477	19.1166	18.6228	(90)
Living area fraction									fLA = Living area / (4) =			0.4943	(91)
MIT	19.2684	19.5071	19.7945	20.1289	20.3490	20.4466	20.4633	20.4627	20.4212	20.1597	19.6720	19.2296	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2684	19.5071	19.7945	20.1289	20.3490	20.4466	20.4633	20.4627	20.4212	20.1597	19.6720	19.2296	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9763	0.9567	0.9241	0.8501	0.7206	0.5311	0.3707	0.4031	0.6252	0.8614	0.9550	0.9800	(94)
Useful gains	496.3158	557.5199	577.7487	563.8155	488.0181	350.0799	235.6121	246.8460	370.5959	471.5164	481.8926	477.2412	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	940.4287	915.7465	831.6904	695.4609	534.6657	358.2468	236.7242	248.5310	388.6513	590.9642	780.1466	936.3614	(97)
Space heating kWh													
	330.4200	240.7283	188.9327	94.7847	34.7059	0.0000	0.0000	0.0000	0.0000	88.8691	214.7429	341.5854	(98a)
Space heating requirement - total per year (kWh/year)												1534.7690	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	330.4200	240.7283	188.9327	94.7847	34.7059	0.0000	0.0000	0.0000	0.0000	88.8691	214.7429	341.5854	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1534.7690	
Space heating per m2											(98c) / (4) =	29.2895	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	330.4200	240.7283	188.9327	94.7847	34.7059	0.0000	0.0000	0.0000	0.0000	88.8691	214.7429	341.5854	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	357.9848	260.8107	204.6941	102.6920	37.6012	0.0000	0.0000	0.0000	0.0000	96.2829	232.6575	370.0817	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.6706	173.1514	184.3773	163.3029	159.0703	144.1864	142.9960	148.2480	149.3860	165.5405	174.7220	193.7070	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2250	84.7989	84.1146	82.8852	81.2753	79.8000	79.8000	79.8000	79.8000	82.7289	84.5234	85.3180	(217)

Fuel for water heating, kWh/month

	229.5929	204.1906	219.1978	197.0231	195.7178	180.6847	179.1929	185.7745	187.2005	200.1000	206.7143	227.0413 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.0239	-26.3350	-39.2250	-45.7701	-50.8286	-48.0115	-47.4556	-44.0892	-38.3703	-30.8829	-20.1524	-15.4789 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.5508	-16.1272	-32.5000	-49.4586	-66.0119	-66.5232	-65.7090	-55.3273	-40.1700	-23.2407	-10.1410	-5.9506 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1662.8049 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2412.4304 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	135.4946 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-863.3338 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3433.3961 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1662.8049	0.2100	349.1890	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2412.4304	0.2100	506.6104	(264)
Space and water heating			855.7994	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	0.1338	-56.8217	
PV Unit electricity exported	-438.7103	0.1255	-55.0685	
Total			-111.8902	(269)
Total CO2, kg/year			775.3946	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1662.8049	1.1300	1878.9696	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2412.4304	1.1300	2726.0463	(278)
Space and water heating			4605.0159	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	1.4945	-634.6082	
PV Unit electricity exported	-438.7103	0.4607	-202.1319	
Total			-836.7401	(283)
Total Primary energy kWh/year			4106.2027	(286)
Target Primary Energy Rate (TPER)			78.3600	(287)

Full SAP Calculation Printout

Property Reference	FLAT 4	**Issued on Date**	17/06/2025
Assessment Reference	Flat 4	**Prop Type Ref**	
Property			

SAP Rating	95 A	**DER**	1.74	**TER**	14.58
Environmental	99 A	**% DER < TER**			88.07
CO_2 Emissions (t/year)	0.07	**DFEE**	34.91	**TFEE**	36.67
Compliance Check	See BREL	**% DFEE < TFEE**			4.80
% DPER < TPER	77.55	**DPER**	17.33	**TPER**	77.19

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			8.3600	0.8687	7.2625			(27)
Door to sCorridor			2.0000	0.9000	1.8000			(26)
Opaque			2.6400	0.9000	2.3760			(26)
Ground Floor			52.4000	0.0900	4.7160			(28a)
External Wall 1	29.1100	11.0000	18.1100	0.1200	2.1732			(29a)
Int Exposed wall	20.5200	2.0000	18.5200	0.1200	2.2224			(29a)
Total net area of external elements Aum(A, m2)			102.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.5501			(33)
Main dwelling								
Party Wall 1			33.5300	0.0000	0.0000			(32)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	18.3700	0.1300	2.3881	
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
P1 Party wall - Ground floor	12.4500	0.2200	2.7390	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4500	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4800	0.0800	0.5984	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.0000	0.0500	1.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1395 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.6896 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	43.3991	43.2634	43.1277	42.4493	42.3136	41.6352	41.6352	41.4995	41.9065	42.3136	42.5850	42.8564	(39)
Average = Sum(39)m / 12 =												42.4154	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8282	0.8256	0.8230	0.8101	0.8075	0.7946	0.7946	0.7920	0.7997	0.8075	0.8127	0.8179	(40)
HLP (average)												0.8095	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)
Hot water usage for baths	23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)
Hot water usage for other uses	32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)
Average daily hot water use (litres/day)												100.7857	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.6302	(55)
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(64)
										Total per year (kWh/year) = Sum(64)m =		2790.6131	(64)
12Total per year (kWh/year)												2791	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	101.6230	90.4434	97.2643	88.0402	87.1225	55.9545	55.3462	57.3894	57.8564	89.5292	92.4758	100.8188	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	136.5901	134.5883	130.7316	122.2780	117.1002	77.7146	74.3900	77.1363	80.3561	120.3349	128.4386	135.5092	(72)
Total internal gains	420.2667	428.5146	411.9877	397.6843	379.0290	332.2011	319.4120	320.5658	330.4920	376.3206	397.9018	412.4146	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	471.4261	515.6580	531.2212	545.4204	544.5057	496.4812	477.7955	465.7140	459.5966	472.6326	459.1790	456.1964	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.8471	84.1101	84.3747	85.7232	85.9981	87.3994	87.3994	87.6852	86.8334	85.9981	85.4501	84.9090	
alpha	6.5898	6.6073	6.6250	6.7149	6.7332	6.8266	6.8266	6.8457	6.7889	6.7332	6.6967	6.6606	
util living area	0.9786	0.9604	0.9282	0.8428	0.6982	0.5331	0.3831	0.4094	0.6188	0.8376	0.9523	0.9819	(86)
Living	20.4276	20.5623	20.7123	20.8824	20.9709	20.9961	20.9996	20.9994	20.9896	20.9036	20.6629	20.4076	
Non living	19.5803	19.7482	19.9311	20.1338	20.2243	20.2559	20.2579	20.2601	20.2472	20.1612	19.8829	19.5629	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7072	20.5623	20.7123	20.8824	20.9709	20.9961	20.9996	20.9994	20.9896	20.9036	20.6629	20.4905	(87)
Th 2	20.2289	20.2312	20.2334	20.2446	20.2468	20.2580	20.2580	20.2603	20.2536	20.2468	20.2423	20.2379	(88)
util rest of house	0.9730	0.9505	0.9111	0.8104	0.6494	0.4729	0.3187	0.3438	0.5562	0.7989	0.9390	0.9771	(89)
MIT 2	19.9704	19.7482	19.9311	20.1338	20.2243	20.2559	20.2579	20.2601	20.2472	20.1612	19.8829	19.6845	(90)
Living area fraction									fLA = Living area / (4) =			0.4739	(91)
MIT	20.3195	20.1339	20.3013	20.4885	20.5781	20.6067	20.6094	20.6104	20.5990	20.5130	20.2525	20.0664	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3195	20.1339	20.3013	20.4885	20.5781	20.6067	20.6094	20.6104	20.5990	20.5130	20.2525	20.0664	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9737	0.9491	0.9127	0.8214	0.6713	0.5014	0.3492	0.3749	0.5855	0.8133	0.9392	0.9758	(94)
Useful gains	459.0458	489.4268	484.8653	447.9884	365.5189	248.9323	166.8489	174.5981	269.1163	384.3988	431.2555	445.1601	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	695.2320	659.0723	595.2174	491.9244	375.6625	250.0880	166.9318	174.7311	272.3511	419.4536	560.1001	679.9771	(97)
Space heating kWh	175.7226	114.0018	82.1019	31.6339	7.5469	0.0000	0.0000	0.0000	0.0000	26.0808	92.7681	174.7038	(98a)
Space heating requirement - total per year (kWh/year)												704.5598	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	175.7226	114.0018	82.1019	31.6339	7.5469	0.0000	0.0000	0.0000	0.0000	26.0808	92.7681	174.7038	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.5598	
Space heating per m2										(98c) / (4) =		13.4458	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 268.8336 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	175.7226	114.0018	82.1019	31.6339	7.5469	0.0000	0.0000	0.0000	0.0000	26.0808	92.7681	174.7038	(98)
Space heating efficiency (main heating system 1)	268.8336	268.8336	268.8336	268.8336	268.8336	0.0000	0.0000	0.0000	0.0000	268.8336	268.8336	268.8336	(210)
Space heating fuel (main heating system)	65.3648	42.4061	30.5401	11.7671	2.8073	0.0000	0.0000	0.0000	0.0000	9.7015	34.5076	64.9859	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(64)
Efficiency of water heater												284.2984	(216)
(217)m	284.2984	284.2984	284.2984	284.2984	284.2984	284.2984	284.2984	284.2984	284.2984	284.2984	284.2984	284.2984	(217)
Fuel for water heating, kWh/month	98.1500	87.2285	93.5390	84.0828	82.8103	65.2617	64.8205	66.9819	67.2737	85.3562	88.7751	97.2992	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.8251	7.9711	8.8251	8.5404	8.8251	8.5404	8.8251	8.8251	8.5404	8.8251	8.5404	8.8251	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.9789	-61.5633	-89.5417	-99.2889	-105.7227	-95.5185	-94.4138	-89.8760	-80.2149	-69.0913	-47.0603	-36.9065	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												262.0802	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												284.2984	

Water heating fuel used	981.5789	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9086	(230a)
Total electricity for the above, kWh/year	103.9086	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-912.1766	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	570.8857	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	262.0802	0.1575	41.2881	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	981.5789	0.1414	138.8304	(264)
Space and water heating			180.1184	(265)
Pumps, fans and electric keep-hot	103.9086	0.1387	14.4134	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.1766	0.1349	-123.0220	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-123.0220	(269)
Total CO2, kg/year			91.0659	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	262.0802	1.5832	414.9234	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	981.5789	1.5230	1494.9654	(278)
Space and water heating			1909.8887	(279)
Pumps, fans and electric keep-hot	103.9086	1.5128	157.1929	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.1766	1.4985	-1366.8684	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1366.8684	(283)
Total Primary energy kWh/year			908.0394	(286)
Dwelling Primary energy Rate (DPER)			17.3300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3033	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.6400	1.0000	4.6400			(26)
TER Opening Type			8.3600	1.1450	9.5725			(27)
Ground Floor			52.4000	0.1300	6.8120			(28a)
External Wall 1	29.1100	11.0000	18.1100	0.1800	3.2598			(29a)
Int Exposed wall	20.5200	2.0000	18.5200	0.1800	3.3336			(29a)
Total net area of external elements Aum(A, m2)			102.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6179			(33)
Main dwelling								
Party Wall 1			33.5300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.3700	0.1600	2.9392
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
P1 Party wall - Ground floor	12.4500	0.0800	0.9960
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4800	0.0200	0.1496
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.0000	0.0500	1.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5288 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.1467 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff													
	61.9820	61.8465	61.7136	61.0894	60.9727	60.4291	60.4291	60.3284	60.6385	60.9727	61.2089	61.4559	(39)
Average = Sum(39)m / 12 =												61.0889	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1829	1.1803	1.1777	1.1658	1.1636	1.1532	1.1532	1.1513	1.1572	1.1636	1.1681	1.1728	(40)
HLP (average)												1.1658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)
Hot water usage for baths													
	23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)
Hot water usage for other uses													
	32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)
Average daily hot water use (litres/day)												100.7857	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m													
	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	220.2399	194.8806	207.1310	182.1438	176.6293	159.2118	157.0799	163.2249	164.9319	183.8674	195.4841	217.8213	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	195.6706	173.1514	184.3773	163.3029	159.0703	144.1864	142.9960	148.2480	149.3860	165.5405	174.7220	193.7070	(64)
									Total per year (kWh/year) = Sum(64)m =			1994.3584	(64)
12Total per year (kWh/year)												1994	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.0129	84.4729	90.6542	81.6433	80.5124	74.0184	74.0122	76.0554	75.9203	82.9190	86.0789	94.2087	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)													
	127.7055	125.7037	121.8470	113.3934	108.2156	102.8033	99.4787	102.2250	105.4448	111.4503	119.5540	126.6246	(72)
Total internal gains													
	414.3821	422.6299	406.1031	391.7997	373.1443	357.2898	344.5007	345.6545	355.5807	370.4359	392.0172	406.5300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.6300	0.7000	0.7700	24.7383	(77)
Southwest	6.1600	36.7938	0.6300	0.7000	0.7700	69.2672	(79)

Solar gains	94.0055	160.1261	219.0915	271.4650	304.0634	301.8646	291.0297	266.7098	237.2298	176.9734	112.5969	80.4491	(83)
Total gains	508.3875	582.7560	625.1946	663.2647	677.2078	659.1544	635.5304	612.3643	592.8104	547.4094	504.6140	486.9791	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.7088	58.8375	58.9642	59.5666	59.6807	60.2175	60.2175	60.3180	60.0096	59.6807	59.4503	59.2114	
alpha	4.9139	4.9225	4.9309	4.9711	4.9787	5.0145	5.0145	5.0212	5.0006	4.9787	4.9634	4.9474	
util living area													
	0.9843	0.9690	0.9416	0.8742	0.7513	0.5693	0.4153	0.4485	0.6643	0.8876	0.9681	0.9870	(86)
MIT	19.9127	20.1231	20.3768	20.6750	20.8811	20.9765	20.9960	20.9941	20.9498	20.6975	20.2613	19.8758	(87)
Th 2	19.9337	19.9358	19.9378	19.9474	19.9492	19.9576	19.9576	19.9592	19.9544	19.9492	19.9456	19.9418	(88)
util rest of house													
	0.9796	0.9601	0.9248	0.8397	0.6904	0.4840	0.3185	0.3495	0.5795	0.8491	0.9573	0.9831	(89)
MIT 2	18.7047	18.9688	19.2820	19.6387	19.8565	19.9452	19.9564	19.9573	19.9242	19.6737	19.1523	18.6643	(90)
Living area fraction									fLA = Living area / (4) =			0.4739	(91)
MIT	19.2771	19.5157	19.8008	20.1297	20.3420	20.4339	20.4490	20.4486	20.4102	20.1588	19.6778	19.2384	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2771	19.5157	19.8008	20.1297	20.3420	20.4339	20.4490	20.4486	20.4102	20.1588	19.6778	19.2384	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9558	0.9223	0.8462	0.7144	0.5238	0.3645	0.3965	0.6178	0.8577	0.9540	0.9797	(94)
Useful gains	496.1072	556.9841	576.6090	561.2859	483.7717	345.2562	231.6361	242.7849	366.2609	469.5235	481.3818	477.0816	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	928.3098	903.9314	820.8389	686.0175	526.9260	352.5365	232.5926	244.2441	382.6399	582.8266	769.8758	924.1963	(97)
Space heating kWh													
	321.5587	233.1486	181.7071	89.8068	32.1067	0.0000	0.0000	0.0000	0.0000	84.2975	207.7157	332.6533	(98a)
Space heating requirement - total per year (kWh/year)												1482.9944	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	321.5587	233.1486	181.7071	89.8068	32.1067	0.0000	0.0000	0.0000	84.2975	207.7157	332.6533	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1482.9944	
Space heating per m2											(98c) / (4) =	28.3014	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	321.5587	233.1486	181.7071	89.8068	32.1067	0.0000	0.0000	0.0000	0.0000	84.2975	207.7157	332.6533	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	348.3843	252.5987	196.8658	97.2988	34.7852	0.0000	0.0000	0.0000	0.0000	91.3299	225.0441	360.4045	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.6706	173.1514	184.3773	163.3029	159.0703	144.1864	142.9960	148.2480	149.3860	165.5405	174.7220	193.7070	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1663	84.7277	84.0271	82.7767	81.1818	79.8000	79.8000	79.8000	79.8000	82.6255	84.4487	85.2612	(217)
Fuel for water heating, kWh/month													
	229.7512	204.3623	219.4261	197.2812	195.9432	180.6847	179.1929	185.7745	187.2005	200.3504	206.8972	227.1923	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0239	-26.3350	-39.2250	-45.7701	-50.8286	-48.0115	-47.4556	-44.0892	-38.3703	-30.8829	-20.1524	-15.4789	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5508	-16.1272	-32.5000	-49.4586	-66.0119	-66.5232	-65.7090	-55.3273	-40.1700	-23.2407	-10.1410	-5.9506	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1606.7112	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2414.0565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3378.9285	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1606.7112	0.2100	337.4093	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2414.0565	0.2100	506.9519	(264)
Space and water heating			844.3612	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	0.1338	-56.8217	
PV Unit electricity exported	-438.7103	0.1255	-55.0685	
Total			-111.8902	(269)
Total CO2, kg/year			763.9564	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1606.7112	1.1300	1815.5836	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2414.0565	1.1300	2727.8839	(278)
Space and water heating			4543.4675	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	1.4945	-634.6082	
PV Unit electricity exported	-438.7103	0.4607	-202.1319	
Total			-836.7401	(283)
Total Primary energy kWh/year			4044.6543	(286)
Target Primary Energy Rate (TPER)			77.1900	(287)

Full SAP Calculation Printout

Property Reference	FLAT 5	**Issued on Date**	17/06/2025
Assessment Reference	FLAT 5	**Prop Type Ref**	
Property			

SAP Rating	95 A	**DER**	1.74	**TER**	14.58
Environmental	99 A	**% DER < TER**			88.07
CO_2 Emissions (t/year)	0.07	**DFEE**	34.91	**TFEE**	36.67
Compliance Check	See BREL	**% DFEE < TFEE**			4.81
% DPER < TPER	77.55	**DPER**	17.33	**TPER**	77.20

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000 (1b)	x	2.7000 (2b)	=	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			8.3600	0.8687	7.2625			(27)
Door to sCorridor			2.0000	0.9000	1.8000			(26)
Opaque			2.6400	0.9000	2.3760			(26)
Ground Floor			52.4000	0.0900	4.7160			(28a)
External Wall 1	29.1100	11.0000	18.1100	0.1200	2.1732			(29a)
Int Exposed wall	20.5200	2.0000	18.5200	0.1200	2.2224			(29a)
Total net area of external elements Aum(A, m2)			102.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.5501			(33)
Main dwelling								
Party Wall 1			33.5300	0.0000	0.0000			(32)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	18.3700	0.1300	2.3881	
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630	
E16 Corner (normal)	5.4000	0.0900	0.4860	
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430	
E18 Party wall between dwellings	5.4000	0.0600	0.3240	
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320	
P1 Party wall - Ground floor	12.4500	0.2200	2.7390	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4500	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4400	0.0800	0.5952	
E2 Other lintels (including other steel lintels)	6.0000	0.2000	1.2000	
E3 Sill	3.8000	0.0400	0.1520	
E4 Jamb	26.0000	0.0500	1.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1363 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.6864 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	43.3959	43.2602	43.1245	42.4461	42.3104	41.6320	41.6320	41.4963	41.9033	42.3104	42.5818	42.8532	(39)
Average = Sum(39)m / 12 =												42.4122	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8282	0.8256	0.8230	0.8100	0.8075	0.7945	0.7945	0.7919	0.7997	0.8075	0.8126	0.8178	(40)
HLP (average)												0.8094	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)
Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.6302	(55)
Total storage loss	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)
If cylinder contains dedicated solar storage	50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(64)
										Total per year (kWh/year) = Sum(64)m =		2790.6131	(64)
12Total per year (kWh/year)												2791	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	101.6230	90.4434	97.2643	88.0402	87.1225	55.9545	55.3462	57.3894	57.8564	89.5292	92.4758	100.8188	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	136.5901	134.5883	130.7316	122.2780	117.1002	77.7146	74.3900	77.1363	80.3561	120.3349	128.4386	135.5092	(72)
Total internal gains	420.2667	428.5146	411.9877	397.6843	379.0290	332.2011	319.4120	320.5658	330.4920	376.3206	397.9018	412.4146	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	471.4261	515.6580	531.2212	545.4204	544.5057	496.4812	477.7955	465.7140	459.5966	472.6326	459.1790	456.1964	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.8533	84.1163	84.3810	85.7297	86.0046	87.4061	87.4061	87.6919	86.8401	86.0046	85.4565	84.9153	
alpha	6.5902	6.6078	6.6254	6.7153	6.7336	6.8271	6.8271	6.8461	6.7893	6.7336	6.6971	6.6610	
util living area	0.9786	0.9604	0.9282	0.8428	0.6982	0.5331	0.3830	0.4093	0.6188	0.8376	0.9523	0.9819	(86)
Living	20.4277	20.5624	20.7124	20.8824	20.9709	20.9961	20.9996	20.9994	20.9896	20.9036	20.6630	20.4077	
Non living	19.5805	19.7483	19.9312	20.1339	20.2243	20.2560	20.2580	20.2601	20.2473	20.1613	19.8831	19.5630	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7072	20.5624	20.7124	20.8824	20.9709	20.9961	20.9996	20.9994	20.9896	20.9036	20.6630	20.4906	(87)
Th 2	20.2290	20.2312	20.2335	20.2446	20.2469	20.2581	20.2581	20.2603	20.2536	20.2469	20.2424	20.2379	(88)
util rest of house	0.9730	0.9505	0.9111	0.8103	0.6493	0.4729	0.3187	0.3438	0.5561	0.7989	0.9390	0.9771	(89)
MIT 2	19.9705	19.7483	19.9312	20.1339	20.2243	20.2560	20.2580	20.2601	20.2473	20.1613	19.8831	19.6847	(90)
Living area fraction										fLA = Living area / (4) =		0.4752	(91)
MIT	20.3206	20.1352	20.3024	20.4896	20.5791	20.6077	20.6104	20.6115	20.6000	20.5140	20.2537	20.0676	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3206	20.1352	20.3024	20.4896	20.5791	20.6077	20.6104	20.6115	20.6000	20.5140	20.2537	20.0676	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9737	0.9491	0.9127	0.8214	0.6713	0.5014	0.3493	0.3750	0.5856	0.8133	0.9392	0.9758	(94)
Useful gains	459.0475	489.4307	484.8708	447.9969	365.5337	248.9552	166.8784	174.6267	269.1376	384.4095	431.2601	445.1621	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	695.2269	659.0764	595.2231	491.9330	375.6782	250.1112	166.9614	174.7598	272.3732	419.4666	560.1073	679.9778	(97)
Space heating kWh	175.7175	114.0019	82.1021	31.6340	7.5474	0.0000	0.0000	0.0000	0.0000	26.0825	92.7700	174.7029	(98a)
Space heating requirement - total per year (kWh/year)												704.5584	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	175.7175	114.0019	82.1021	31.6340	7.5474	0.0000	0.0000	0.0000	0.0000	26.0825	92.7700	174.7029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.5584	
Space heating per m2											(98c) / (4) =	13.4458	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												268.8247	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	175.7175	114.0019	82.1021	31.6340	7.5474	0.0000	0.0000	0.0000	0.0000	26.0825	92.7700	174.7029	(98)
Space heating efficiency (main heating system 1)	268.8247	268.8247	268.8247	268.8247	268.8247	0.0000	0.0000	0.0000	0.0000	268.8247	268.8247	268.8247	(210)
Space heating fuel (main heating system)	65.3651	42.4075	30.5411	11.7675	2.8076	0.0000	0.0000	0.0000	0.0000	9.7024	34.5095	64.9877	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	279.0388	247.9893	265.9299	239.0460	235.4282	185.5380	184.2836	190.4286	191.2580	242.6663	252.3862	276.6202	(64)
Efficiency of water heater												284.2928	(216)
(217)m	284.2928	284.2928	284.2928	284.2928	284.2928	284.2928	284.2928	284.2928	284.2928	284.2928	284.2928	284.2928	(217)
Fuel for water heating, kWh/month	98.1519	87.2303	93.5409	84.0844	82.8119	65.2630	64.8218	66.9833	67.2750	85.3579	88.7769	97.3012	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.8251	7.9711	8.8251	8.5404	8.8251	8.5404	8.8251	8.8251	8.5404	8.8251	8.5404	8.8251	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.9789	-61.5635	-89.5421	-99.2892	-105.7231	-95.5189	-94.4141	-89.8763	-80.2151	-69.0916	-47.0604	-36.9066	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												262.0884	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												284.2928	

Water heating fuel used	981.5983	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	103.9086	(230a)
Total electricity for the above, kWh/year	103.9086	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-912.1797	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	570.9102	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	262.0884	0.1575	41.2893	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	981.5983	0.1414	138.8331	(264)
Space and water heating			180.1224	(265)
Pumps, fans and electric keep-hot	103.9086	0.1387	14.4134	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.1797	0.1349	-123.0224	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-123.0224	(269)
Total CO2, kg/year			91.0695	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	262.0884	1.5832	414.9362	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	981.5983	1.5230	1494.9949	(278)
Space and water heating			1909.9311	(279)
Pumps, fans and electric keep-hot	103.9086	1.5128	157.1929	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.1797	1.4985	-1366.8731	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1366.8731	(283)
Total Primary energy kWh/year			908.0771	(286)
Dwelling Primary energy Rate (DPER)			17.3300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3033	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.6400	1.0000	4.6400			(26)
TER Opening Type			8.3600	1.1450	9.5725			(27)
Ground Floor			52.4000	0.1300	6.8120			(28a)
External Wall 1	29.1100	11.0000	18.1100	0.1800	3.2598			(29a)
Int Exposed wall	20.5200	2.0000	18.5200	0.1800	3.3336			(29a)
Total net area of external elements Aum(A, m2)			102.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6179			(33)
Main dwelling								
Party Wall 1			33.5300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.3700	0.1600	2.9392
E7 Party floor between dwellings (in blocks of flats)	10.9000	0.0700	0.7630
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
P1 Party wall - Ground floor	12.4500	0.0800	0.9960
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.4500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4400	0.0200	0.1488
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.0000	0.0500	1.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5280 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.1459 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff													
	61.9812	61.8457	61.7128	61.0886	60.9719	60.4283	60.4283	60.3276	60.6377	60.9719	61.2081	61.4551	(39)
Average = Sum(39)m / 12 =												61.0881	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1828	1.1803	1.1777	1.1658	1.1636	1.1532	1.1532	1.1513	1.1572	1.1636	1.1681	1.1728	(40)
HLP (average)												1.1658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m													
	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	220.2399	194.8806	207.1310	182.1438	176.6293	159.2118	157.0799	163.2249	164.9319	183.8674	195.4841	217.8213	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	195.6706	173.1514	184.3773	163.3029	159.0703	144.1864	142.9960	148.2480	149.3860	165.5405	174.7220	193.7070	(64)
									Total per year (kWh/year) = Sum(64)m =			1994.3584	(64)
12Total per year (kWh/year)												1994	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.0129	84.4729	90.6542	81.6433	80.5124	74.0184	74.0122	76.0554	75.9203	82.9190	86.0789	94.2087	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)													
	127.7055	125.7037	121.8470	113.3934	108.2156	102.8033	99.4787	102.2250	105.4448	111.4503	119.5540	126.6246	(72)
Total internal gains													
	414.3821	422.6299	406.1031	391.7997	373.1443	357.2898	344.5007	345.6545	355.5807	370.4359	392.0172	406.5300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.6300	0.7000	0.7700	24.7383	(77)
Southwest	6.1600	36.7938	0.6300	0.7000	0.7700	69.2672	(79)

Solar gains	94.0055	160.1261	219.0915	271.4650	304.0634	301.8646	291.0297	266.7098	237.2298	176.9734	112.5969	80.4491	(83)
Total gains	508.3875	582.7560	625.1946	663.2647	677.2078	659.1544	635.5304	612.3643	592.8104	547.4094	504.6140	486.9791	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.7095	58.8382	58.9649	59.5674	59.6814	60.2183	60.2183	60.3188	60.0104	59.6814	59.4511	59.2122	
alpha	4.9140	4.9225	4.9310	4.9712	4.9788	5.0146	5.0146	5.0213	5.0007	4.9788	4.9634	4.9475	
util living area													
	0.9843	0.9690	0.9416	0.8742	0.7513	0.5693	0.4153	0.4485	0.6643	0.8876	0.9681	0.9870	(86)
MIT	19.9127	20.1231	20.3769	20.6750	20.8811	20.9765	20.9960	20.9941	20.9498	20.6975	20.2614	19.8759	(87)
Th 2	19.9337	19.9358	19.9379	19.9474	19.9492	19.9576	19.9576	19.9592	19.9544	19.9492	19.9456	19.9418	(88)
util rest of house													
	0.9796	0.9601	0.9248	0.8397	0.6904	0.4840	0.3185	0.3495	0.5794	0.8491	0.9573	0.9831	(89)
MIT 2	18.7047	18.9688	19.2820	19.6387	19.8565	19.9452	19.9564	19.9573	19.9243	19.6737	19.1524	18.6643	(90)
Living area fraction									fLA = Living area / (4) =			0.4752	(91)
MIT	19.2787	19.5173	19.8023	20.1311	20.3434	20.4353	20.4504	20.4500	20.4116	20.1602	19.6793	19.2400	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2787	19.5173	19.8023	20.1311	20.3434	20.4353	20.4504	20.4500	20.4116	20.1602	19.6793	19.2400	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9759	0.9558	0.9223	0.8463	0.7144	0.5239	0.3646	0.3966	0.6179	0.8578	0.9540	0.9797	(94)
Useful gains	496.1122	556.9935	576.6252	561.3164	483.8233	345.3273	231.7156	242.8631	366.3242	469.5518	481.3912	477.0857	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	928.3998	904.0169	820.9203	686.0944	527.0033	352.6155	232.6738	244.3249	382.7185	582.9035	769.9581	924.2857	(97)
Space heating kWh													
	321.6219	233.1998	181.7555	89.8401	32.1260	0.0000	0.0000	0.0000	0.0000	84.3337	207.7682	332.7168	(98a)
Space heating requirement - total per year (kWh/year)												1483.3619	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	321.6219	233.1998	181.7555	89.8401	32.1260	0.0000	0.0000	0.0000	0.0000	84.3337	207.7682	332.7168	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1483.3619	
Space heating per m2											(98c) / (4) =	28.3084	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	321.6219	233.1998	181.7555	89.8401	32.1260	0.0000	0.0000	0.0000	0.0000	84.3337	207.7682	332.7168	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	348.4528	252.6541	196.9182	97.3349	34.8060	0.0000	0.0000	0.0000	0.0000	91.3691	225.1009	360.4732	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.6706	173.1514	184.3773	163.3029	159.0703	144.1864	142.9960	148.2480	149.3860	165.5405	174.7220	193.7070	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1667	84.7282	84.0277	82.7775	81.1825	79.8000	79.8000	79.8000	79.8000	82.6264	84.4493	85.2616	(217)
Fuel for water heating, kWh/month													
	229.7501	204.3611	219.4246	197.2794	195.9416	180.6847	179.1929	185.7745	187.2005	200.3483	206.8958	227.1912	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0239	-26.3350	-39.2250	-45.7701	-50.8286	-48.0115	-47.4556	-44.0892	-38.3703	-30.8829	-20.1524	-15.4789	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5508	-16.1272	-32.5000	-49.4586	-66.0119	-66.5232	-65.7090	-55.3273	-40.1700	-23.2407	-10.1410	-5.9506	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1607.1094	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2414.0447	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.4946	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3379.3149	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1607.1094	0.2100	337.4930	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2414.0447	0.2100	506.9494	(264)
Space and water heating			844.4424	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	0.1338	-56.8217	
PV Unit electricity exported	-438.7103	0.1255	-55.0685	
Total			-111.8902	(269)
Total CO2, kg/year			764.0375	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1607.1094	1.1300	1816.0336	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2414.0447	1.1300	2727.8705	(278)
Space and water heating			4543.9041	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6235	1.4945	-634.6082	
PV Unit electricity exported	-438.7103	0.4607	-202.1319	
Total			-836.7401	(283)
Total Primary energy kWh/year			4045.0909	(286)
Target Primary Energy Rate (TPER)			77.2000	(287)

Full SAP Calculation Printout

Property Reference	FLAT 6	**Issued on Date**	17/06/2025
Assessment Reference	Flat 6	**Prop Type Ref**	
Property			

SAP Rating	95 A	**DER**	1.67	**TER**	13.80
Environmental	99 A	**% DER < TER**			87.90
CO_2 Emissions (t/year)	0.08	**DFEE**	35.33	**TFEE**	36.07
Compliance Check	See BREL	**% DFEE < TFEE**			2.05
% DPER < TPER	77.18	**DPER**	16.66	**TPER**	72.97

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.0300 (1b)	x	2.7000 (2b)	=	162.0810	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	162.0810	(5)

---

2. Ventilation rate

---

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

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

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

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			12.3200	0.8687	10.7027			(27)
OPAQUE			5.2800	0.9000	4.7520			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	53.0000	17.6000	35.4000	0.1200	4.2480			(29a)
EXPOSED WALL TO CORRIDOR	20.1200	2.2000	17.9200	0.1200	2.1504			(29a)
Total net area of external elements Aum(A, m2)			73.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.8331			(33)
Main dwelling								
Party Wall 1			16.6300	0.0000	0.0000			(32)
Party Floor 1			60.0300					(32d)
Party Ceiling 1			60.0300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.1000	0.0000	0.0000	
E7 Party floor between dwellings (in blocks of flats)	14.3500	0.0700	1.0045	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.4400	0.0800	0.6752	
E16 Corner (normal)	13.5000	0.0900	1.2150	
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860	
E25 Staggered party wall between dwellings	2.7000	0.0800	0.2160	
E18 Party wall between dwellings	2.7000	0.0600	0.1620	
P8 Party Wall - Exposed floor (inverted)	4.3600	0.2400	1.0464	
E5 Ground floor (normal)	27.1400	0.1300	3.5282	
P1 Party wall - Ground floor	6.1000	0.2200	1.3420	
E2 Other lintels (including other steel lintels)	9.0000	0.2000	1.8000	
E3 Sill	5.6000	0.0400	0.2240	
E4 Jamb	39.6000	0.0500	1.9800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.7073 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.5404 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.5601	14.4046	14.2492	13.4720	13.3165	12.5393	12.5393	12.3838	12.8502	13.3165	13.6274	13.9383	(38)
Heat transfer coeff	51.1005	50.9450	50.7896	50.0124	49.8569	49.0797	49.0797	48.9243	49.3906	49.8569	50.1678	50.4787	(39)
Average = Sum(39)m / 12 =												49.9735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8512	0.8487	0.8461	0.8331	0.8305	0.8176	0.8176	0.8150	0.8228	0.8305	0.8357	0.8409	(40)
HLP (average)												0.8325	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9825 (42)
Hot water usage for mixer showers

57.4593	56.5958	55.3375	52.9300	51.1533	49.1720	48.0458	49.2945	50.6634	52.7908	55.2500	57.2391	(42a)

Hot water usage for baths

24.8326	24.4638	23.9445	22.9869	22.2698	21.4748	21.0453	21.5610	22.1226	22.9733	23.9506	24.7486	(42b)

Hot water usage for other uses

34.9326	33.6623	32.3920	31.1218	29.8515	28.5812	28.5812	29.8515	31.1218	32.3920	33.6623	34.9326	(42c)

Average daily hot water use (litres/day) 107.7562 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.2245	114.7219	111.6740	107.0386	103.2746	99.2280	97.6723	100.7071	103.9077	108.1561	112.8629	116.9204	(44)
Energy conte	185.6549	163.3625	171.6388	146.5305	139.0275	122.0123	118.1262	124.6964	128.1286	146.7668	160.7939	183.0691	(45)
Energy content (annual)										Total = Sum(45)m =		1789.8076	
Distribution loss (46)m = 0.15 x (45)m	27.8482	24.5044	25.7458	21.9796	20.8541	18.3019	17.7189	18.7045	19.2193	22.0150	24.1191	27.4604	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)
Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)

Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

291.0487	258.5569	277.0326	248.5245	244.4213	193.4303	191.9248	198.4950	199.5466	252.1606	262.7879	288.4629	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

291.0487	258.5569	277.0326	248.5245	244.4213	193.4303	191.9248	198.4950	199.5466	252.1606	262.7879	288.4629	(64)

Total per year (kWh/year) = Sum(64)m = 2906.3922 (64)
12Total per year (kWh/year) 2906 (64)
Electric shower(s)

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

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

105.6163	93.9571	100.9560	91.1918	90.1127	58.5787	57.8869	60.0715	60.6124	92.6861	95.9344	104.7565	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.6677	97.0607	87.6677	90.5900	87.6677	90.5900	87.6677	87.6677	90.5900	87.6677	90.5900	87.6677	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.0226	174.8180	170.2936	160.6616	148.5030	137.0755	129.4413	127.6459	132.1703	141.8023	153.9610	165.3884	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	(71)
Water heating gains (Table 5)	141.9575	139.8171	135.6935	126.6553	121.1193	81.3593	77.8049	80.7412	84.1838	124.5780	133.2422	140.8018	(72)
Total internal gains	455.3850	464.4330	446.3920	430.6441	410.0271	361.7620	347.6512	348.7920	359.6814	406.7853	430.5303	446.5951	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	75.3929	128.4219	175.7125	217.7163	243.8604	242.0969	233.4073	213.9026	190.2595	141.9336	90.3033	64.5206	(83)
Total gains	530.7778	592.8549	622.1045	648.3604	653.8875	603.8590	581.0585	562.6946	549.9408	548.7189	520.8336	511.1157	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.5794	81.8284	82.0788	83.3544	83.6143	84.9384	84.9384	85.2083	84.4037	83.6143	83.0961	82.5843	
alpha	6.4386	6.4552	6.4719	6.5570	6.5743	6.6626	6.6626	6.6806	6.6269	6.5743	6.5397	6.5056	
util living area	0.9817	0.9626	0.9273	0.8359	0.6859	0.5169	0.3713	0.3994	0.6095	0.8422	0.9578	0.9849	(86)
Living	20.3724	20.5285	20.6983	20.8803	20.9712	20.9963	20.9996	20.9994	20.9894	20.8931	20.6240	20.3479	
Non living	19.4954	19.6901	19.8970	20.1126	20.2048	20.2361	20.2380	20.2402	20.2272	20.1317	19.8194	19.4719	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6790	20.5285	20.6983	20.8803	20.9712	20.9963	20.9996	20.9994	20.9894	20.8931	20.6240	20.4391	(87)
Th 2	20.2091	20.2114	20.2136	20.2247	20.2269	20.2381	20.2381	20.2404	20.2336	20.2269	20.2225	20.2180	(88)
util rest of house	0.9767	0.9531	0.9098	0.8024	0.6362	0.4569	0.3072	0.3338	0.5461	0.8034	0.9456	0.9808	(89)
MIT 2	19.9246	19.6901	19.8970	20.1126	20.2048	20.2361	20.2380	20.2402	20.2272	20.1317	19.8194	19.6064	(90)
Living area fraction									fLA = Living area / (4) =			0.4874	(91)
MIT	20.2923	20.0988	20.2876	20.4868	20.5783	20.6066	20.6092	20.6102	20.5987	20.5028	20.2116	20.0123	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2923	20.0988	20.2876	20.4868	20.5783	20.6066	20.6092	20.6102	20.5987	20.5028	20.2116	20.0123	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9773	0.9516	0.9116	0.8143	0.6592	0.4861	0.3385	0.3658	0.5767	0.8180	0.9454	0.9795	(94)
Useful gains	518.7345	564.1459	567.1128	527.9532	431.0433	293.5282	196.6767	205.8245	317.1430	448.8430	492.3795	500.6298	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	817.2136	774.3024	700.2660	579.4820	442.6462	294.8037	196.7725	205.9831	320.9754	493.7236	657.7802	798.1821	(97)
Space heating kWh	222.0684	141.2252	99.0660	37.1008	8.6326	0.0000	0.0000	0.0000	0.0000	33.3911	119.0885	221.3789	(98a)
Space heating requirement - total per year (kWh/year)												881.9515	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	222.0684	141.2252	99.0660	37.1008	8.6326	0.0000	0.0000	0.0000	0.0000	33.3911	119.0885	221.3789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												881.9515	
Space heating per m2											(98c) / (4) =	14.6918	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	287.9691	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	222.0684	141.2252	99.0660	37.1008	8.6326	0.0000	0.0000	0.0000	0.0000	33.3911	119.0885	221.3789	(98)
Space heating efficiency (main heating system 1)	287.9691	287.9691	287.9691	287.9691	287.9691	0.0000	0.0000	0.0000	0.0000	287.9691	287.9691	287.9691	(210)
Space heating fuel (main heating system)	77.1154	49.0418	34.4016	12.8836	2.9977	0.0000	0.0000	0.0000	0.0000	11.5954	41.3546	76.8759	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	291.0487	258.5569	277.0326	248.5245	244.4213	193.4303	191.9248	198.4950	199.5466	252.1606	262.7879	288.4629	(64)
Efficiency of water heater												288.6764	(216)
(217)m	288.6764	288.6764	288.6764	288.6764	288.6764	288.6764	288.6764	288.6764	288.6764	288.6764	288.6764	288.6764	(217)
Fuel for water heating, kWh/month	100.8218	89.5663	95.9665	86.0910	84.6697	67.0059	66.4844	68.7604	69.1247	87.3506	91.0320	99.9260	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1101	9.1317	10.1101	9.7840	10.1101	9.7840	10.1101	10.1101	9.7840	10.1101	9.7840	10.1101	(231)
Lighting	18.2156	14.6132	13.1576	9.6398	7.4461	6.0835	6.7926	8.8292	11.4683	15.0470	16.9956	18.7219	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.8869	-63.3184	-92.7440	-103.6685	-111.0640	-100.9428	-99.7158	-94.4933	-83.7903	-71.3487	-48.2096	-37.6238	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												306.2660	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	288.6764	
Water heating fuel used	1006.7993	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	119.0388	(230a)
Total electricity for the above, kWh/year	119.0388	(231)
Electricity for lighting (calculated in Appendix L)	147.0105	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-950.8061	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	628.3085	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	306.2660	0.1576	48.2703	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1006.7993	0.1414	142.4032	(264)
Space and water heating			190.6734	(265)
Pumps, fans and electric keep-hot	119.0388	0.1387	16.5121	(267)
Energy for lighting	147.0105	0.1443	21.2182	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-950.8061	0.1347	-128.0624	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-128.0624	(269)
Total CO2, kg/year			100.3414	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	306.2660	1.5834	484.9525	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1006.7993	1.5230	1533.3973	(278)
Space and water heating			2018.3499	(279)
Pumps, fans and electric keep-hot	119.0388	1.5128	180.0819	(281)
Energy for lighting	147.0105	1.5338	225.4895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-950.8061	1.4978	-1424.1172	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1424.1172	(283)
Total Primary energy kWh/year			999.8041	(286)
Dwelling Primary energy Rate (DPER)			16.6600	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		60.0300	(1b)	x 2.7000	(2b) =	162.0810	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.0810	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3734	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2894 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3690	0.3617	0.3545	0.3183	0.3111	0.2749	0.2749	0.2677	0.2894	0.3111	0.3256	0.3400	(22b)
Effective ac	0.5681	0.5654	0.5628	0.5507	0.5484	0.5378	0.5378	0.5358	0.5419	0.5484	0.5530	0.5578	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			7.4800	1.0000	7.4800			(26)
TER Opening Type			7.5200	1.1450	8.6107			(27)
External Wall 1	53.0000	12.8000	40.2000	0.1800	7.2360			(29a)
EXPOSED WALL TO CORRIDOR	20.1200	2.2000	17.9200	0.1800	3.2256			(29a)
Total net area of external elements Aum(A, m2)			73.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5523			(33)
Main dwelling								
Party Wall 1			16.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.1000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.3500	0.0700	1.0045
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.4400	0.0200	0.1688
E16 Corner (normal)	13.5000	0.0900	1.2150
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860
E25 Staggered party wall between dwellings	2.7000	0.0600	0.1620
E18 Party wall between dwellings	2.7000	0.0600	0.1620
P8 Party Wall - Exposed floor (inverted)	4.3600	0.2400	1.0464
E5 Ground floor (normal)	27.1400	0.1600	4.3424
P1 Party wall - Ground floor	6.1000	0.0800	0.4880
E2 Other lintels (including other steel lintels)	9.0000	0.0500	0.4500
E3 Sill	5.6000	0.0500	0.2800
E4 Jamb	39.6000	0.0500	1.9800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.8131 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 37.3654 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.3840	30.2426	30.1041	29.4532	29.3314	28.7645	28.7645	28.6596	28.9829	29.3314	29.5778	29.8353	(38)
Heat transfer coeff	67.7494	67.6080	67.4694	66.8186	66.6968	66.1299	66.1299	66.0249	66.3483	66.6968	66.9432	67.2007	(39)
Average = Sum(39)m / 12 =												66.8180	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1286	1.1262	1.1239	1.1131	1.1111	1.1016	1.1016	1.0999	1.1053	1.1111	1.1152	1.1195	(40)
HLP (average)												1.1131	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9825 (42)

Hot water usage for mixer showers

57.4593	56.5958	55.3375	52.9300	51.1533	49.1720	48.0458	49.2945	50.6634	52.7908	55.2500	57.2391	(42a)

Hot water usage for baths

24.8326	24.4638	23.9445	22.9869	22.2698	21.4748	21.0453	21.5610	22.1226	22.9733	23.9506	24.7486	(42b)

Hot water usage for other uses

34.9326	33.6623	32.3920	31.1218	29.8515	28.5812	28.5812	29.8515	31.1218	32.3920	33.6623	34.9326	(42c)

Average daily hot water use (litres/day) 107.7562 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	117.2245	114.7219	111.6740	107.0386	103.2746	99.2280	97.6723	100.7071	103.9077	108.1561	112.8629	116.9204	(44)
Energy conte	185.6549	163.3625	171.6388	146.5305	139.0275	122.0123	118.1262	124.6964	128.1286	146.7668	160.7939	183.0691	(45)
Energy content (annual)										Total = Sum(45)m =		1789.8076	
Distribution loss (46)m = 0.15 x (45)m	27.8482	24.5044	25.7458	21.9796	20.8541	18.3019	17.7189	18.7045	19.2193	22.0150	24.1191	27.4604	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.2498	205.4482	218.2337	191.6224	185.6224	167.1042	164.7211	171.2913	173.2205	193.3617	205.8858	229.6640	(62)
WWHRS -26.2680	-23.2316	-24.3268	-20.1436	-18.7731	-16.0643	-15.0577	-16.0123	-16.6207	-19.5940	-22.1976	-25.7815	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
205.9818	182.2166	193.9069	171.4788	166.8493	151.0399	149.6634	155.2789	156.5998	173.7678	183.6882	203.8824	(64)
									Total per year (kWh/year) = Sum(64)m =		2094.3539	(64)
12Total per year (kWh/year)											2094	(64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

99.0062	87.9866	94.3458	84.7949	83.5026	76.6426	76.5529	78.7375	78.6762	86.0759	89.5375	98.1464	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	99.1241	(66)

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

	95.9478	106.2279	95.9478	99.1460	95.9478	99.1460	95.9478	95.9478	99.1460	95.9478	99.1460	95.9478	(67)

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

	173.0226	174.8180	170.2936	160.6616	148.5030	137.0755	129.4413	127.6459	132.1703	141.8023	153.9610	165.3884	(68)

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

	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	32.9124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000		(70)

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

	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	-79.2993	(71)

Water heating gains (Table 5)

	133.0728	130.9324	126.8089	117.7707	112.2346	106.4480	102.8937	105.8299	109.2726	115.6934	124.3576	131.9172	(72)

Total internal gains

	457.7804	467.7156	448.7875	433.3155	412.4226	395.4068	381.0200	382.1608	393.3262	409.1807	433.2018	448.9906	(73)

6. Solar gains

[Jan]

	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.7600	36.7938	0.6300	0.7000	0.7700	42.2800	(77)
Southwest	3.7600	36.7938	0.6300	0.7000	0.7700	42.2800	(79)

Solar gains	84.5599	144.0369	197.0775	244.1886	273.5116	271.5337	261.7875	239.9112	213.3933	159.1914	101.2833	72.3657	(83)
Total gains	542.3404	611.7525	645.8650	677.5041	685.9342	666.9405	642.8075	622.0720	606.7194	568.3722	534.4851	521.3563	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.5319	61.6606	61.7872	62.3891	62.5030	63.0388	63.0388	63.1390	62.8313	62.5030	62.2730	62.0343	
alpha	5.1021	5.1107	5.1191	5.1593	5.1669	5.2026	5.2026	5.2093	5.1888	5.1669	5.1515	5.1356	
util living area													
	0.9876	0.9763	0.9560	0.9019	0.7930	0.6114	0.4486	0.4822	0.7025	0.9088	0.9747	0.9897	(86)
MIT	19.9319	20.1189	20.3525	20.6450	20.8627	20.9722	20.9953	20.9932	20.9431	20.6814	20.2640	19.8993	(87)
Th 2	19.9776	19.9795	19.9813	19.9902	19.9918	19.9995	19.9995	20.0009	19.9965	19.9918	19.9885	19.9850	(88)
util rest of house													
	0.9839	0.9692	0.9427	0.8727	0.7364	0.5255	0.3488	0.3806	0.6197	0.8757	0.9659	0.9866	(89)
MIT 2	18.7617	18.9978	19.2890	19.6447	19.8812	19.9843	19.9981	19.9987	19.9613	19.6948	19.1894	18.7259	(90)
Living area fraction									fLA = Living area / (4) =			0.4874	(91)
MIT	19.3321	19.5443	19.8074	20.1323	20.3596	20.4658	20.4842	20.4834	20.4398	20.1757	19.7132	19.2979	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3321	19.5443	19.8074	20.1323	20.3596	20.4658	20.4842	20.4834	20.4398	20.1757	19.7132	19.2979	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9656	0.9400	0.8773	0.7583	0.5666	0.3976	0.4302	0.6578	0.8825	0.9630	0.9838	(94)
Useful gains	531.9364	590.6803	607.1333	594.3789	520.1587	377.8810	255.5501	267.6371	399.1244	501.5897	514.6965	512.9176	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1018.4150	990.0693	897.8404	750.5236	577.5683	387.9076	256.8592	269.6092	420.6380	638.6695	844.3650	1014.5865	(97)
Space heating kWh													
	361.9401	268.3895	216.2860	112.4242	42.7127	0.0000	0.0000	0.0000	0.0000	101.9874	237.3614	373.2417	(98a)
Space heating requirement - total per year (kWh/year)												1714.3429	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	361.9401	268.3895	216.2860	112.4242	42.7127	0.0000	0.0000	0.0000	0.0000	101.9874	237.3614	373.2417	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1714.3429	
Space heating per m2										(98c) / (4) =		28.5581	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	361.9401	268.3895	216.2860	112.4242	42.7127	0.0000	0.0000	0.0000	0.0000	101.9874	237.3614	373.2417	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	392.1344	290.7795	234.3294	121.8030	46.2760	0.0000	0.0000	0.0000	0.0000	110.4956	257.1629	404.3788	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	205.9818	182.2166	193.9069	171.4788	166.8493	151.0399	149.6634	155.2789	156.5998	173.7678	183.6882	203.8824	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3104	84.9268	84.3053	83.1367	81.4832	79.8000	79.8000	79.8000	79.8000	82.9078	84.6357	85.3975	(217)
Fuel for water heating, kWh/month													

	241.4500	214.5573	230.0055	206.2614	204.7653	189.2731	187.5481	194.5852	196.2403	209.5917	217.0339	238.7451 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	19.9361	15.9934	14.4003	10.5503	8.1493	6.6581	7.4341	9.6631	12.5515	16.4682	18.6008	20.4901 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.5668	-30.0036	-44.6109	-51.9478	-57.5806	-54.3346	-53.6972	-49.9415	-43.5446	-35.1353	-22.9769	-17.6675 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-8.7317	-18.6416	-37.5580	-57.1473	-76.2732	-76.8776	-75.9453	-63.9510	-46.4320	-26.8692	-11.7276	-6.8824 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1857.3595 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2530.0569 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	160.8954 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-989.0444 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3645.2674 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1857.3595	0.2100	390.0455	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2530.0569	0.2100	531.3119	(264)
Space and water heating			921.3574	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8954	0.1443	23.2222	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-482.0073	0.1339	-64.5218	
PV Unit electricity exported	-507.0371	0.1255	-63.6455	
Total			-128.1672	(269)
Total CO2, kg/year			828.3417	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1857.3595	1.1300	2098.8163	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2530.0569	1.1300	2858.9643	(278)
Space and water heating			4957.7806	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8954	1.5338	246.7867	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-482.0073	1.4947	-720.4490	
PV Unit electricity exported	-507.0371	0.4607	-233.6140	
Total			-954.0630	(283)
Total Primary energy kWh/year			4380.6050	(286)
Target Primary Energy Rate (TPER)			72.9700	(287)

Full SAP Calculation Printout

Property Reference	FLAT 7	**Issued on Date**	17/06/2025
Assessment Reference	Flat 7	**Prop Type Ref**	
Property			

SAP Rating	95 A	**DER**	1.77	**TER**	14.82
Environmental	99 A	**% DER < TER**			88.06
CO_2 Emissions (t/year)	0.08	**DFEE**	34.66	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			6.44
% DPER < TPER	77.52	**DPER**	17.66	**TPER**	78.53

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b)	x 2.7000	(2b) =	136.5660	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	136.5660	(5)

---

2. Ventilation rate

---

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.2000	(23c)
Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			9.9000	0.8687	8.6004			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	52.2900	12.5400	39.7500	0.1200	4.7700	135.0000	5366.2501	(29a)
EXPOSED EXT. WALL	11.7000	2.2000	9.5000	0.1200	1.1400	135.0000	1282.5000	(29a)
Total net area of external elements Aum(A, m2)			63.9900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.8664			(33)
Main dwelling								
Party Wall 1			18.6300	0.0000	0.0000	180.0000	3353.3998	(32)
Party Floor 1			50.5800			40.0000	2023.2000	(32d)
Party Ceiling 1			50.5800			30.0000	1517.4000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13542.7499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		267.7491 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	36.2000	0.0700	2.5340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.2000	0.0800	0.8960
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E16 Corner (normal)	8.1000	0.0900	0.7290
E18 Party wall between dwellings	2.7000	0.0600	0.1620
P8 Party Wall - Exposed floor (inverted)	6.9000	0.2400	1.6560
E2 Other lintels (including other steel lintels)	7.1000	0.2000	1.4200
E3 Sill	4.9000	0.0400	0.1960
E4 Jamb	29.2000	0.0500	1.4600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8100 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.6764 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9144	12.7708	12.6271	11.9089	11.7652	11.0470	11.0470	10.9033	11.3343	11.7652	12.0525	12.3398	(38)
Heat transfer coeff	40.5908	40.4472	40.3035	39.5853	39.4416	38.7234	38.7234	38.5797	39.0107	39.4416	39.7289	40.0162	(39)

Average = Sum(39)m / 12 = 39.5494

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8025	0.7997	0.7968	0.7826	0.7798	0.7656	0.7656	0.7627	0.7713	0.7798	0.7855	0.7911	(40)
HLP (average)												0.7819	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)

Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)

Water storage loss:

Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	2.0900	(48)
Temperature factor from Table 2b	0.7800	(49)
Enter (49) or (54) in (55)	1.6302	(55)

Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)

Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(64)
									Total per year (kWh/year) = Sum(64)m =			2762.5671	(64)
12Total per year (kWh/year)												2763	(64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

100.6557	89.5922	96.3701	87.2767	86.3982	55.3188	54.7307	56.7397	57.1888	88.7645	91.6380	99.8650	(65)

---

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.7321	83.8463	75.7321	78.2566	75.7321	78.2566	75.7321	75.7321	78.2566	75.7321	78.2566	75.7321	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	(71)
Water heating gains (Table 5)	135.2899	133.3217	129.5297	121.2177	116.1266	76.8317	73.5628	76.2630	79.4289	119.3071	127.2750	134.2271	(72)
Total internal gains	408.3701	416.0595	400.2639	386.1961	368.1283	321.5341	309.1780	310.3348	319.9145	365.5485	386.4932	400.7445	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.7400	36.7938	0.3000	0.8000	0.7700	22.8871	(79)
Northwest	6.1600	11.2829	0.3000	0.8000	0.7700	11.5597	(81)

Solar gains	34.4468	62.5154	95.7351	135.7153	167.6159	173.2672	164.1918	139.3433	109.4149	71.8427	41.9586	29.0269	(83)
Total gains	442.8170	478.5749	495.9990	521.9114	535.7442	494.8013	473.3698	449.6781	429.3295	437.3912	428.4518	429.7714	(84)

---

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.6779	93.0071	93.3386	95.0322	95.3783	97.1474	97.1474	97.5091	96.4319	95.3783	94.6885	94.0087	
alpha	7.1785	7.2005	7.2226	7.3355	7.3586	7.4765	7.4765	7.5006	7.4288	7.3586	7.3126	7.2672	
util living area	0.9832	0.9686	0.9375	0.8390	0.6708	0.4994	0.3598	0.3944	0.6195	0.8503	0.9601	0.9857	(86)
Living	20.4823	20.5993	20.7449	20.9120	20.9841	20.9985	20.9999	20.9998	20.9931	20.9179	20.6984	20.4681	
Non living	19.6643	19.8110	19.9890	20.1874	20.2590	20.2825	20.2832	20.2857	20.2743	20.1990	19.9448	19.6548	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.7352	20.5993	20.7449	20.9120	20.9841	20.9985	20.9999	20.9998	20.9931	20.9179	20.6984	20.5425	(87)
Th 2	20.2512	20.2536	20.2561	20.2684	20.2709	20.2833	20.2833	20.2857	20.2783	20.2709	20.2659	20.2610	(88)
util rest of house	0.9784	0.9602	0.9214	0.8058	0.6230	0.4442	0.3013	0.3333	0.5580	0.8123	0.9481	0.9815	(89)
MIT 2	20.0172	19.8110	19.9890	20.1874	20.2590	20.2825	20.2832	20.2857	20.2743	20.1990	19.9448	19.7640	(90)
Living area fraction										fLA = Living area / (4) =		0.5061	(91)
MIT	20.3806	20.2100	20.3715	20.5541	20.6260	20.6449	20.6459	20.6471	20.6381	20.5628	20.3262	20.1580	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3806	20.2100	20.3715	20.5541	20.6260	20.6449	20.6459	20.6471	20.6381	20.5628	20.3262	20.1580	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9596	0.9241	0.8193	0.6466	0.4721	0.3309	0.3643	0.5890	0.8283	0.9492	0.9809	(94)
Useful gains	433.6448	459.2372	458.3634	427.6147	346.3919	233.6189	156.6458	163.7984	252.8664	362.2751	406.6780	421.5541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	652.7250	619.2449	559.0725	461.3325	352.0560	234.0776	156.6727	163.8520	255.0564	392.9507	525.4632	638.5804	(97)
Space heating kWh	162.9956	107.5252	74.9276	24.2768	4.2140	0.0000	0.0000	0.0000	0.0000	22.8226	85.5253	161.4675	(98a)
Space heating requirement - total per year (kWh/year)												643.7546	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	162.9956	107.5252	74.9276	24.2768	4.2140	0.0000	0.0000	0.0000	0.0000	22.8226	85.5253	161.4675	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												643.7546	
Space heating per m2											(98c) / (4) =	12.7275	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 260.4955 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	162.9956	107.5252	74.9276	24.2768	4.2140	0.0000	0.0000	0.0000	0.0000	22.8226	85.5253	161.4675	(98)
Space heating efficiency (main heating system 1)	260.4955	260.4955	260.4955	260.4955	260.4955	0.0000	0.0000	0.0000	0.0000	260.4955	260.4955	260.4955	(210)
Space heating fuel (main heating system)	62.5714	41.2772	28.7635	9.3195	1.6177	0.0000	0.0000	0.0000	0.0000	8.7612	32.8318	61.9848	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	276.1295	245.4295	263.2404	236.7499	233.2498	183.6261	182.4326	188.4746	189.2502	240.3664	249.8666	273.7514	(64)
Efficiency of water heater												279.0054	(216)
(217)m	279.0054	279.0054	279.0054	279.0054	279.0054	279.0054	279.0054	279.0054	279.0054	279.0054	279.0054	279.0054	(217)
Fuel for water heating, kWh/month	98.9693	87.9659	94.3496	84.8550	83.6005	65.8146	65.3868	67.5523	67.8303	86.1512	89.5562	98.1169	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5186	7.6942	8.5186	8.2438	8.5186	8.2438	8.5186	8.5186	8.2438	8.5186	8.2438	8.5186	(231)
Lighting	15.7356	12.6237	11.3663	8.3274	6.4323	5.2553	5.8678	7.6272	9.9069	12.9984	14.6817	16.1730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.7613	-61.1812	-88.7239	-97.9320	-104.3219	-94.3501	-93.2664	-88.8627	-79.4071	-68.5323	-46.7873	-36.7305	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 247.1269 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 279.0054

Water heating fuel used 990.1484 (219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	100.2995	(230a)
Total electricity for the above, kWh/year	100.2995	(231)
Electricity for lighting (calculated in Appendix L)	126.9957	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-902.8568	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	561.7138	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	247.1269	0.1578	39.0032	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	990.1484	0.1414	140.0410	(264)
Space and water heating			179.0441	(265)
Pumps, fans and electric keep-hot	100.2995	0.1387	13.9128	(267)
Energy for lighting	126.9957	0.1443	18.3294	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-902.8568	0.1349	-121.7958	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-121.7958	(269)
Total CO2, kg/year			89.4905	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	247.1269	1.5843	391.5116	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	990.1484	1.5230	1508.0117	(278)
Space and water heating			1899.5233	(279)
Pumps, fans and electric keep-hot	100.2995	1.5128	151.7331	(281)
Energy for lighting	126.9957	1.5338	194.7902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-902.8568	1.4986	-1353.0180	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1353.0180	(283)
Total Primary energy kWh/year			893.0286	(286)
Dwelling Primary energy Rate (DPER)			17.6600	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	50.5800	(1b) x	2.7000	(2b) =	136.5660	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.5660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1464	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3964	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3370	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4297	0.4212	0.4128	0.3707	0.3623	0.3201	0.3201	0.3117	0.3370	0.3623	0.3791	0.3960	(22b)
Effective ac	0.5923	0.5887	0.5852	0.5687	0.5656	0.5512	0.5512	0.5486	0.5568	0.5656	0.5719	0.5784	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			7.8000	1.1450	8.9313			(27)
External Wall 1	52.2900	10.4400	41.8500	0.1800	7.5330			(29a)
EXPOSED EXT. WALL	11.7000	2.2000	9.5000	0.1800	1.7100			(29a)
Total net area of external elements Aum(A, m2)			63.9900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.0143			(33)
Main dwelling								
Party Wall 1			18.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 277.7491 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	36.2000	0.0700	2.5340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.2000	0.0200	0.2240
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E16 Corner (normal)	8.1000	0.0900	0.7290
E18 Party wall between dwellings	2.7000	0.0600	0.1620
P8 Party Wall - Exposed floor (inverted)	6.9000	0.2400	1.6560
E2 Other lintels (including other steel lintels)	7.1000	0.0500	0.3550
E3 Sill	4.9000	0.0500	0.2450
E4 Jamb	29.2000	0.0500	1.4600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.1220 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.1363 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.6931	26.5315	26.3732	25.6296	25.4904	24.8427	24.8427	24.7228	25.0922	25.4904	25.7719	26.0662	(38)
Heat transfer coeff													
	56.8294	56.6678	56.5095	55.7659	55.6267	54.9790	54.9790	54.8591	55.2285	55.6267	55.9082	56.2025	(39)
Average = Sum(39)m / 12 =												55.7652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1236	1.1204	1.1172	1.1025	1.0998	1.0870	1.0870	1.0846	1.0919	1.0998	1.1053	1.1112	(40)
HLP (average)												1.1025	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7072 (42)

Hot water usage for mixer showers

52.8434	52.0493	50.8921	48.6780	47.0440	45.2218	44.1861	45.3346	46.5935	48.5499	50.8116	52.6409	(42a)

Hot water usage for baths

22.8476	22.5083	22.0305	21.1494	20.4897	19.7582	19.3631	19.8376	20.3542	21.1370	22.0361	22.7704	(42b)

Hot water usage for other uses

32.1133	30.9456	29.7778	28.6100	27.4423	26.2745	26.2745	27.4423	28.6100	29.7778	30.9456	32.1133	(42c)

Average daily hot water use (litres/day) 99.0971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	107.8044	105.5031	102.7003	98.4374	94.9760	91.2546	89.8237	92.6144	95.5577	99.4647	103.7933	107.5246	(44)
Energy conte	170.7357	150.2351	157.8466	134.7559	127.8560	112.2081	108.6340	114.6760	117.8322	134.9726	147.8726	168.3576	(45)
Energy content (annual)										Total = Sum(45)m =		1645.9825	
Distribution loss (46)m = 0.15 x (45)m													
	25.6104	22.5353	23.6770	20.2134	19.1784	16.8312	16.2951	17.2014	17.6748	20.2459	22.1809	25.2536	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	217.3306	192.3208	204.4415	179.8478	174.4509	157.3000	155.2289	161.2709	162.9241	181.5675	192.9644	214.9525	(62)
WWHRS	-24.1578	-21.3654	-22.3726	-18.5254	-17.2650	-14.7738	-13.8481	-14.7260	-15.2855	-18.0199	-20.4144	-23.7104	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	193.1728	170.9554	182.0689	161.3224	157.1859	142.5262	141.3809	146.5449	147.6386	163.5476	172.5500	191.2421	(64)
										Total per year (kWh/year) = Sum(64)m =		1970.1357	(64)
12Total per year (kWh/year)												1970	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	94.0456	83.6217	89.7599	80.8798	79.7880	73.3827	73.3967	75.4057	75.2527	82.1543	85.2411	93.2548	(65)

---

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	85.3594	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	78.8520	87.3004	78.8520	81.4804	78.8520	81.4804	78.8520	78.8520	81.4804	78.8520	81.4804	78.8520 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	148.7402	150.2837	146.3942	138.1140	127.6617	117.8381	111.2753	109.7318	113.6213	121.9015	132.3538	142.1774 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359	31.5359 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875	-68.2875 (71)
Water heating gains (Table 5)												
	126.4053	124.4371	120.6450	112.3331	107.2420	101.9204	98.6515	101.3517	104.5176	110.4225	118.3904	125.3425 (72)
Total internal gains												
	405.6053	413.6290	397.4991	383.5353	365.3635	349.8466	337.3866	338.5433	348.2271	362.7837	383.8324	397.9797 (73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	2.9400	36.7938	0.6300	0.7000	0.7700	33.0593	(79)
Northwest	4.8600	11.2829	0.6300	0.7000	0.7700	16.7583	(81)

Solar gains	49.8177	90.4243	138.5080	196.4008	242.6057	250.8013	237.6585	201.6664	158.3165	103.9247	60.6838	41.9776 (83)
Total gains	455.4230	504.0533	536.0070	579.9361	607.9692	600.6479	575.0450	540.2097	506.5436	466.7084	444.5161	439.9573 (84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6683	68.8640	69.0569	69.9778	70.1529	70.9793	70.9793	71.1345	70.6587	70.1529	69.7997	69.4342	
alpha	5.5779	5.5909	5.6038	5.6652	5.6769	5.7320	5.7320	5.7423	5.7106	5.6769	5.6533	5.6289	
util living area													
	0.9913	0.9834	0.9659	0.9062	0.7740	0.5742	0.4190	0.4640	0.7092	0.9250	0.9814	0.9927	(86)
MIT	20.0262	20.1842	20.4090	20.7070	20.9081	20.9862	20.9981	20.9966	20.9571	20.7115	20.3308	20.0048	(87)
Th 2	19.9816	19.9842	19.9868	19.9988	20.0010	20.0115	20.0115	20.0134	20.0075	20.0010	19.9965	19.9917	(88)
util rest of house													
	0.9883	0.9779	0.9542	0.8762	0.7139	0.4908	0.3258	0.3662	0.6245	0.8941	0.9741	0.9902	(89)
MIT 2	18.8740	19.0750	19.3567	19.7195	19.9311	20.0047	20.0110	20.0124	19.9824	19.7346	19.2709	18.8545	(90)
Living area fraction										fLA = Living area / (4) =		0.5061	(91)
MIT	19.4571	19.6364	19.8893	20.2193	20.4256	20.5015	20.5106	20.5106	20.4757	20.2290	19.8074	19.4367	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4571	19.6364	19.8893	20.2193	20.4256	20.5015	20.5106	20.5106	20.4757	20.2290	19.8074	19.4367	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9756	0.9529	0.8835	0.7407	0.5328	0.3730	0.4158	0.6660	0.9021	0.9724	0.9884	(94)
Useful gains	449.1929	491.7318	510.7705	512.3779	450.3305	320.0147	214.5198	224.6286	337.3791	421.0186	432.2281	434.8588	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	861.3698	835.0787	756.6212	631.2300	485.3778	324.4569	214.9991	225.5016	352.1204	535.6322	710.4453	856.3414	(97)
Space heating kWh													
	306.6596	230.7291	182.9129	85.5735	26.0752	0.0000	0.0000	0.0000	0.0000	85.2725	200.3164	313.5831	(98a)
Space heating requirement - total per year (kWh/year)												1431.1223	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	306.6596	230.7291	182.9129	85.5735	26.0752	0.0000	0.0000	0.0000	0.0000	85.2725	200.3164	313.5831	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1431.1223	
Space heating per m2											(98c) / (4) =	28.2942	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	306.6596	230.7291	182.9129	85.5735	26.0752	0.0000	0.0000	0.0000	0.0000	85.2725	200.3164	313.5831	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	332.2422	249.9774	198.1722	92.7124	28.2505	0.0000	0.0000	0.0000	0.0000	92.3863	217.0275	339.7433	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	193.1728	170.9554	182.0689	161.3224	157.1859	142.5262	141.3809	146.5449	147.6386	163.5476	172.5500	191.2421	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0911	84.7329	84.0702	82.7053	80.9676	79.8000	79.8000	79.8000	79.8000	82.6715	84.3953	85.1615	(217)
Fuel for water heating, kWh/month													
	227.0189	201.7581	216.5678	195.0569	194.1343	178.6043	177.1690	183.6402	185.0107	197.8283	204.4546	224.5641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.3839	13.1438	11.8345	8.6705	6.6973	5.4718	6.1095	7.9414	10.3151	13.5339	15.2865	16.8392	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-17.4212	-25.4665	-37.9498	-44.3059	-49.2256	-46.5090	-45.9744	-42.7044	-37.1490	-29.8789	-19.4841	-14.9603 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.2652	-15.5209	-31.2839	-47.6153	-63.5567	-64.0476	-63.2597	-53.2590	-38.6634	-22.3648	-9.7571	-5.7249 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1550.5117	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2385.8072	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	132.2273	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-833.3478	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3321.1984	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1550.5117	0.2100	325.6075	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2385.8072	0.2100	501.0195	(264)
Space and water heating			826.6270	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2273	0.1443	19.0845	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-411.0292	0.1338	-54.9976	
PV Unit electricity exported	-422.3186	0.1255	-53.0097	
Total			-108.0073	(269)
Total CO2, kg/year			749.6334	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1550.5117	1.1300	1752.0782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2385.8072	1.1300	2695.9621	(278)
Space and water heating			4448.0403	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2273	1.5338	202.8147	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-411.0292	1.4945	-614.2728	
PV Unit electricity exported	-422.3186	0.4607	-194.5750	
Total			-808.8479	(283)
Total Primary energy kWh/year			3972.1079	(286)
Target Primary Energy Rate (TPER)			78.5300	(287)

Full SAP Calculation Printout

Property Reference	flat 8	**Issued on Date**	17/06/2025
Assessment Reference	Flat 8	**Prop Type Ref**	
Property			

SAP Rating	94 A	**DER**	1.64	**TER**	8.56
Environmental	99 A	**% DER < TER**			80.84
CO_2 Emissions (t/year)	0.1	**DFEE**	36.31	**TFEE**	37.57
Compliance Check	See BREL	**% DFEE < TFEE**			3.35
% DPER < TPER	64.32	**DPER**	16.37	**TPER**	45.89

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.6900	(1b)	x 2.7000	(2b) =	209.7630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.6900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	209.7630	(5)

---

2. Ventilation rate

---

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.2000 (23c)

Effective ac	0.2866	0.2834	0.2802	0.2642	0.2611	0.2451	0.2451	0.2419	0.2515	0.2611	0.2674	0.2738	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			15.4000	0.8687	13.3784			(27)
OPAQUE			5.2800	0.9000	4.7520			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
explosed ext floor			5.7400	0.0900	0.5166			(28b)
exposed floor			18.2300	0.0900	1.6407			(28b)
External Wall 1	58.0000	20.6800	37.3200	0.1200	4.4784			(29a)
Exposed internal wall	11.4800	2.2000	9.2800	0.1200	1.1136			(29a)
Total net area of external elements Aum(A, m2)			93.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8597			(33)
Main dwelling								
Party Wall 1			35.5700	0.0000	0.0000			(32)
Party Floor 1			53.7200					(32d)
Party Ceiling 1			77.6900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	18.2800	0.0000	0.0000
E7	Party floor between dwellings (in blocks of flats)	28.1700	0.0700	1.9719
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	15.8600	0.0800	1.2688
E16	Corner (normal)	10.8000	0.0900	0.9720
E17	Corner (inverted - internal area greater than external area)	8.1000	-0.0900	-0.7290
E18	Party wall between dwellings	5.4000	0.0600	0.3240
E25	Staggered party wall between dwellings	5.4000	0.0800	0.4320
P8	Party Wall - Exposed floor (inverted)	19.2800	0.2400	4.6272
E20	Exposed floor (normal)	7.4000	0.3200	2.3680
E2	Other lintels (including other steel lintels)	10.4000	0.2000	2.0800
E3	Sill	7.0000	0.0400	0.2800
E4	Jamb	44.0000	0.0500	2.2000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.7949 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.6546 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8364	19.6157	19.3951	18.2919	18.0712	16.9680	16.9680	16.7473	17.4093	18.0712	18.5125	18.9538	(38)
Heat transfer coeff	63.4909	63.2703	63.0497	61.9464	61.7258	60.6226	60.6226	60.4019	61.0639	61.7258	62.1671	62.6084	(39)
Average = Sum(39)m / 12 =												61.8913	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8172	0.8144	0.8116	0.7974	0.7945	0.7803	0.7803	0.7775	0.7860	0.7945	0.8002	0.8059	(40)
HLP (average)												0.7966	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4176 (42)
Hot water usage for mixer showers

64.7544	63.7813	62.3632	59.6500	57.6478	55.4149	54.1457	55.5530	57.0957	59.4931	62.2646	64.5063	(42a)

Hot water usage for baths

27.9697	27.5543	26.9694	25.8908	25.0832	24.1877	23.7040	24.2849	24.9173	25.8755	26.9763	27.8752	(42b)

Hot water usage for other uses

39.3883	37.9560	36.5237	35.0914	33.6591	32.2268	32.2268	33.6591	35.0914	36.5237	37.9560	39.3883	(42c)

Average daily hot water use (litres/day) 121.4413 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.1124	129.2916	125.8563	120.6323	116.3901	111.8294	110.0765	113.4970	117.1044	121.8924	127.1969	131.7698	(44)
Energy conte	209.2338	184.1095	193.4365	165.1396	156.6835	137.5073	133.1280	140.5330	144.4015	165.4069	181.2153	206.3196	(45)
Energy content (annual)										Total = Sum(45)m =		2017.1144	
Distribution loss (46)m = 0.15 x (45)m	31.3851	27.6164	29.0155	24.7709	23.5025	20.6261	19.9692	21.0799	21.6602	24.8110	27.1823	30.9479	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.0900 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 1.6302 (55)
Total storage loss

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(56)

If cylinder contains dedicated solar storage

50.5362	45.6456	50.5362	48.9060	50.5362	48.9060	50.5362	50.5362	48.9060	50.5362	48.9060	50.5362	(57)
Primary loss 54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

314.6276	279.3039	298.8303	267.1336	262.0773	208.9253	206.9266	214.3316	215.8195	270.8007	283.2093	311.7134	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

314.6276	279.3039	298.8303	267.1336	262.0773	208.9253	206.9266	214.3316	215.8195	270.8007	283.2093	311.7134	(64)
									Total per year (kWh/year) = Sum(64)m =		3133.6990	(64)
12Total per year (kWh/year)											3134	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

113.4563	100.8555	108.2037	97.3793	95.9833	63.7308	62.8750	65.3371	66.0231	98.8839	102.7245	112.4874	(65)

---

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.0798	120.7669	109.0798	112.7158	109.0798	112.7158	109.0798	109.0798	112.7158	109.0798	112.7158	109.0798	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	214.5450	216.7713	211.1611	199.2176	184.1411	169.9713	160.5050	158.2787	163.8889	175.8324	190.9089	205.0787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	(71)
Water heating gains (Table 5)	152.4951	150.0825	145.4351	135.2490	129.0099	88.5150	84.5094	87.8187	91.6987	132.9084	142.6729	151.1927	(72)
Total internal gains	535.3834	546.8843	524.9395	506.4460	481.4943	430.4656	413.3577	414.4408	427.5670	477.0842	505.5612	524.6147	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.3000	0.8000	0.7700	56.5446	(79)

Northwest				6.1600		11.2829		0.3000		0.8000		0.7700	11.5597 (81)
Solar gains	68.1044	119.8466	174.1782	232.9101	276.4821	281.3462	268.3915	234.8355	194.3522	135.2059	82.2726	57.8307 (83)	
Total gains	603.4878	666.7309	699.1177	739.3561	757.9764	711.8118	681.7492	649.2763	621.9192	612.2901	587.8338	582.4454 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.9749	85.2713	85.5697	87.0936	87.4049	88.9956	88.9956	89.3206	88.3524	87.4049	86.7845	86.1728	
alpha	6.6650	6.6848	6.7046	6.8062	6.8270	6.9330	6.9330	6.9547	6.8902	6.8270	6.7856	6.7449	
util living area													
	0.9898	0.9789	0.9554	0.8778	0.7263	0.5413	0.3909	0.4273	0.6618	0.8919	0.9754	0.9916 (86)	
Living	20.3200	20.4621	20.6379	20.8517	20.9652	20.9961	20.9996	20.9994	20.9856	20.8586	20.5715	20.3019	
Non living	19.4536	19.6339	19.8528	20.1126	20.2307	20.2682	20.2703	20.2727	20.2564	20.1267	19.7825	19.4387	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6521	20.4621	20.6379	20.8517	20.9652	20.9961	20.9996	20.9994	20.9856	20.8586	20.5715	20.3995 (87)	
Th 2	20.2384	20.2409	20.2433	20.2556	20.2581	20.2704	20.2704	20.2729	20.2655	20.2581	20.2532	20.2482 (88)	
util rest of house													
	0.9869	0.9731	0.9434	0.8492	0.6778	0.4813	0.3263	0.3601	0.5977	0.8603	0.9676	0.9892 (89)	
MIT 2	19.9256	19.6339	19.8528	20.1126	20.2307	20.2682	20.2703	20.2727	20.2564	20.1267	19.7825	19.5845 (90)	
Living area fraction										fLA = Living area / (4) =		0.4082 (91)	
MIT	20.2221	19.9720	20.1732	20.4143	20.5305	20.5653	20.5680	20.5693	20.5541	20.4254	20.1045	19.9172 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2221	19.9720	20.1732	20.4143	20.5305	20.5653	20.5680	20.5693	20.5541	20.4254	20.1045	19.9172 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9706	0.9421	0.8557	0.6961	0.5058	0.3527	0.3875	0.6234	0.8680	0.9657	0.9879 (94)	
Useful gains	595.5233	647.1412	658.6284	632.6710	527.6310	359.9992	240.4362	251.6194	387.7060	531.4937	567.6942	575.4080 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
	1010.9101	953.6069	862.0910	713.2686	545.0703	361.6331	240.5499	251.8320	394.1098	606.4823	808.4522	984.0276 (97)	
Space heating kWh													
	309.0477	205.9449	151.3762	58.0303	12.9748	0.0000	0.0000	0.0000	0.0000	55.7915	173.3458	304.0130 (98a)	
Space heating requirement - total per year (kWh/year)												1270.5242	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	309.0477	205.9449	151.3762	58.0303	12.9748	0.0000	0.0000	0.0000	0.0000	55.7915	173.3458	304.0130 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1270.5242	
Space heating per m2											(98c) / (4) =	16.3538 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Efficiency of main space heating system 1 (in %)												311.9023 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	309.0477	205.9449	151.3762	58.0303	12.9748	0.0000	0.0000	0.0000	0.0000	55.7915	173.3458	304.0130 (98)	
Space heating efficiency (main heating system 1)													
	311.9023	311.9023	311.9023	311.9023	311.9023	0.0000	0.0000	0.0000	0.0000	311.9023	311.9023	311.9023 (210)	
Space heating fuel (main heating system)													
	99.0848	66.0287	48.5332	18.6053	4.1599	0.0000	0.0000	0.0000	0.0000	17.8875	55.5769	97.4706 (211)	
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement													
	314.6276	279.3039	298.8303	267.1336	262.0773	208.9253	206.9266	214.3316	215.8195	270.8007	283.2093	311.7134 (64)	
Efficiency of water heater												288.8784 (216)	
(217)m	288.8784	288.8784	288.8784	288.8784	288.8784	288.8784	288.8784	288.8784	288.8784	288.8784	288.8784	288.8784 (217)	
Fuel for water heating, kWh/month													
	108.9135	96.6857	103.4450	92.4727	90.7224	72.3229	71.6311	74.1944	74.7095	93.7421	98.0376	107.9047 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	13.0844	11.8182	13.0844	12.6623	13.0844	12.6623	13.0844	13.0844	12.6623	13.0844	12.6623	13.0844 (231)	
Lighting	22.6646	18.1824	16.3712	11.9943	9.2647	7.5694	8.4516	10.9857	14.2693	18.7221	21.1466	23.2945 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.5042	-66.7451	-99.3988	-112.7535	-121.8587	-111.7032	-110.2626	-103.6680	-90.8485	-75.9108	-50.3570	-38.8760 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												407.3469 (211)	
Space heating fuel - main system 2												0.0000 (213)	

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	288.8784	
Water heating fuel used	1084.7815	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)		
mechanical ventilation fans (SFP = 0.6020)	154.0583	(230a)
Total electricity for the above, kWh/year	154.0583	(231)
Electricity for lighting (calculated in Appendix L)	182.9165	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1027.8865	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	801.2168	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	407.3469	0.1573	64.0632	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1084.7815	0.1415	153.4438	(264)
Space and water heating			217.5070	(265)
Pumps, fans and electric keep-hot	154.0583	0.1387	21.3698	(267)
Energy for lighting	182.9165	0.1443	26.4005	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1027.8865	0.1344	-138.1160	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-138.1160	(269)
Total CO2, kg/year			127.1614	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	407.3469	1.5822	644.5039	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1084.7815	1.5231	1652.2066	(278)
Space and water heating			2296.7105	(279)
Pumps, fans and electric keep-hot	154.0583	1.5128	233.0595	(281)
Energy for lighting	182.9165	1.5338	280.5635	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1027.8865	1.4966	-1538.3369	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1538.3369	(283)
Total Primary energy kWh/year			1271.9965	(286)
Dwelling Primary energy Rate (DPER)			16.3700	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.6900	(1b)	x 2.7000	(2b)	= 209.7630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.6900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 209.7630	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1430	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3930	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3341 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4259	0.4176	0.4092	0.3675	0.3591	0.3174	0.3174	0.3090	0.3341	0.3591	0.3758	0.3925	(22b)
Effective ac	0.5907	0.5872	0.5837	0.5675	0.5645	0.5504	0.5504	0.5477	0.5558	0.5645	0.5706	0.5770	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			7.4800	1.0000	7.4800			(26)
TER Opening Type			11.9500	1.1450	13.6832			(27)
explosed ext floor			5.7400	0.1300	0.7462			(28b)
exposed floor			18.2300	0.1300	2.3699			(28b)
External Wall 1	58.0000	17.2300	40.7700	0.1800	7.3386			(29a)
Exposed internal wall	11.4800	2.2000	9.2800	0.1800	1.6704			(29a)
Total net area of external elements Aum(A, m2)			93.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.2883			(33)
Main dwelling								
Party Wall 1			35.5700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.2800	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	28.1700	0.0700	1.9719
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	15.8600	0.0200	0.3172
E16 Corner (normal)	10.8000	0.0900	0.9720
E17 Corner (inverted - internal area greater than external area)	8.1000	-0.0900	-0.7290
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
P8 Party Wall - Exposed floor (inverted)	19.2800	0.2400	4.6272
E20 Exposed floor (normal)	7.4000	0.3200	2.3680
E2 Other lintels (including other steel lintels)	10.4000	0.0500	0.5200
E3 Sill	7.0000	0.0500	0.3500
E4 Jamb	44.0000	0.0500	2.2000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2453 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.5336 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.8900	40.6462	40.4072	39.2846	39.0746	38.0969	38.0969	37.9158	38.4735	39.0746	39.4995	39.9437	(38)
Heat transfer coeff	87.4236	87.1798	86.9408	85.8182	85.6082	84.6305	84.6305	84.4494	85.0071	85.6082	86.0331	86.4773	(39)
Average = Sum(39)m / 12 =												85.8172	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1253	1.1221	1.1191	1.1046	1.1019	1.0893	1.0893	1.0870	1.0942	1.1019	1.1074	1.1131	(40)
HLP (average)												1.1046	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4176 (42)
Hot water usage for mixer showers

64.7544	63.7813	62.3632	59.6500	57.6478	55.4149	54.1457	55.5530	57.0957	59.4931	62.2646	64.5063	(42a)

Hot water usage for baths

27.9697	27.5543	26.9694	25.8908	25.0832	24.1877	23.7040	24.2849	24.9173	25.8755	26.9763	27.8752	(42b)

Hot water usage for other uses

39.3883	37.9560	36.5237	35.0914	33.6591	32.2268	32.2268	33.6591	35.0914	36.5237	37.9560	39.3883	(42c)

Average daily hot water use (litres/day) 121.4413 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.1124	129.2916	125.8563	120.6323	116.3901	111.8294	110.0765	113.4970	117.1044	121.8924	127.1969	131.7698	(44)
Energy conte	209.2338	184.1095	193.4365	165.1396	156.6835	137.5073	133.1280	140.5330	144.4015	165.4069	181.2153	206.3196	(45)
Energy content (annual)										Total = Sum(45)m =		2017.1144	
Distribution loss (46)m = 0.15 x (45)m	31.3851	27.6164	29.0155	24.7709	23.5025	20.6261	19.9692	21.0799	21.6602	24.8110	27.1823	30.9479	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	255.8287	226.1953	240.0314	210.2314	203.2784	182.5991	179.7229	187.1279	189.4933	212.0018	226.3072	252.9145	(62)
WWHRS	-29.6030	-26.1811	-27.4154	-22.7010	-21.1565	-18.1038	-16.9694	-18.0453	-18.7309	-22.0816	-25.0158	-29.0548	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.2257	200.0141	212.6160	187.5304	182.1218	164.4954	162.7535	169.0826	170.7624	189.9201	201.2914	223.8597	(64)
										Total per year (kWh/year) = Sum(64)m =		2290.6732	(64)
12Total per year (kWh/year)												2291	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	106.8462	94.8850	101.5935	90.9824	89.3732	81.7947	81.5410	84.0031	84.0870	92.2737	96.3276	105.8772	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	120.8785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	113.7970	125.9895	113.7970	117.5902	113.7970	117.5902	113.7970	113.7970	117.5902	113.7970	117.5902	113.7970	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	214.5450	216.7713	211.1611	199.2176	184.1411	169.9713	160.5050	158.2787	163.8889	175.8324	190.9089	205.0787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	35.0878	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	-96.7028	(71)
Water heating gains (Table 5)													
	143.6104	141.1979	136.5505	126.3644	120.1252	113.6037	109.5981	112.9074	116.7875	124.0238	133.7883	142.3081	(72)
Total internal gains													
	534.2160	546.2223	523.7721	505.4358	480.3269	460.4288	443.1636	444.2467	457.5301	475.9167	504.5510	523.4473	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.1700	36.7938	0.6300	0.7000	0.7700	80.6243	(79)
Northwest	4.7800	11.2829	0.6300	0.7000	0.7700	16.4825	(81)

Solar gains	97.1068	170.8836	248.3524	332.0954	394.2227	401.1580	382.6866	334.8407	277.1175	192.7837	117.3085	82.4580	(83)
Total gains	631.3228	717.1059	772.1245	837.5312	874.5495	861.5868	825.8502	779.0874	734.6476	668.7004	621.8595	605.9053	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.7126	61.8852	62.0553	62.8671	63.0213	63.7494	63.7494	63.8860	63.4669	63.0213	62.7101	62.3879	
alpha	5.1142	5.1257	5.1370	5.1911	5.2014	5.2500	5.2500	5.2591	5.2311	5.2014	5.1807	5.1592	
util living area													
	0.9922	0.9841	0.9671	0.9139	0.7969	0.6071	0.4471	0.4921	0.7327	0.9324	0.9835	0.9936	(86)
MIT	19.8446	20.0321	20.2869	20.6202	20.8619	20.9740	20.9956	20.9929	20.9327	20.6286	20.1875	19.8181	(87)
Th 2	19.9802	19.9828	19.9853	19.9971	19.9993	20.0096	20.0096	20.0115	20.0056	19.9993	19.9948	19.9901	(88)
util rest of house													
	0.9897	0.9792	0.9567	0.8872	0.7410	0.5222	0.3485	0.3897	0.6508	0.9055	0.9775	0.9915	(89)
MIT 2	18.6534	18.8924	19.2130	19.6234	19.8877	19.9954	20.0082	20.0091	19.9628	19.6435	19.0999	18.6270	(90)
Living area fraction									fLA = Living area / (4) =			0.4082	(91)
MIT	19.1396	19.3576	19.6513	20.0303	20.2853	20.3948	20.4112	20.4106	20.3587	20.0456	19.5438	19.1132	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1396	19.3576	19.6513	20.0303	20.2853	20.3948	20.4112	20.4106	20.3587	20.0456	19.5438	19.1132	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9869	0.9753	0.9525	0.8882	0.7581	0.5561	0.3888	0.4316	0.6816	0.9069	0.9740	0.9891	(94)
Useful gains	623.0754	699.3788	735.4659	743.8914	663.0133	479.1208	321.1296	336.2863	500.7082	606.4751	605.6719	599.3223	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1297.3314	1260.4075	1143.3885	955.1791	734.9762	490.4196	322.5458	338.6952	532.0309	808.6191	1070.5789	1289.6510	(97)
Space heating kWh													
	501.6464	377.0113	303.4944	152.1271	53.5404	0.0000	0.0000	0.0000	0.0000	150.3951	334.7330	513.6045	(98a)
Space heating requirement - total per year (kWh/year)												2386.5522	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	501.6464	377.0113	303.4944	152.1271	53.5404	0.0000	0.0000	0.0000	0.0000	150.3951	334.7330	513.6045	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2386.5522	
Space heating per m2											(98c) / (4) =	30.7189	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	501.6464	377.0113	303.4944	152.1271	53.5404	0.0000	0.0000	0.0000	0.0000	150.3951	334.7330	513.6045	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	543.4956	408.4629	328.8130	164.8181	58.0069	0.0000	0.0000	0.0000	0.0000	162.9416	362.6576	556.4513	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	226.2257	200.0141	212.6160	187.5304	182.1218	164.4954	162.7535	169.0826	170.7624	189.9201	201.2914	223.8597	(64)
Efficiency of water heater												79.8000	(216)

(217)m	85.7927	85.4591	84.8574	83.5947	81.6808	79.8000	79.8000	79.8000	79.8000	83.5418	85.1919	85.8605 (217)
Fuel for water heating, kWh/month												
	263.6888	234.0466	250.5568	224.3330	222.9678	206.1345	203.9517	211.8830	213.9880	227.3353	236.2799	260.7248 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	23.6448	18.9687	17.0792	12.5130	9.6654	7.8967	8.8171	11.4608	14.8864	19.5318	22.0611	24.3019 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-59.9502	-78.7693	-105.6201	-110.5514	-112.7629	-103.0567	-101.7699	-99.1057	-93.6563	-85.9649	-63.8278	-52.5344 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-53.8033	-110.0986	-213.4054	-313.0168	-406.9323	-406.3825	-401.5749	-343.0888	-255.6834	-154.7712	-70.9144	-42.7820 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2585.6471	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2755.8902	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	190.8268	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3840.0230	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1778.3411	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2585.6471	0.2100	542.9859	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2755.8902	0.2100	578.7369	(264)
Space and water heating			1121.7228	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	190.8268	0.1443	27.5422	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1067.5696	0.1361	-145.3099	
PV Unit electricity exported	-2772.4534	0.1266	-351.0208	
Total			-496.3307	(269)
Total CO2, kg/year			664.8636	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2585.6471	1.1300	2921.7812	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2755.8902	1.1300	3114.1560	(278)
Space and water heating			6035.9371	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	190.8268	1.5338	292.6966	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1067.5696	1.5031	-1604.6988	
PV Unit electricity exported	-2772.4534	0.4648	-1288.5755	
Total			-2893.2743	(283)
Total Primary energy kWh/year			3565.4602	(286)
Target Primary Energy Rate (TPER)			45.8900	(287)

Full SAP Calculation Printout

Property Reference	FLAT 9	**Issued on Date**	17/06/2025
Assessment Reference	Flat 9	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	5.17	**TER**	13.04
Environmental	96 A	**% DER < TER**			60.35
CO_2 Emissions (t/year)	0.26	**DFEE**	25.80	**TFEE**	26.91
Compliance Check	See BREL	**% DFEE < TFEE**			4.13
% DPER < TPER	40.96	**DPER**	40.69	**TPER**	68.91

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b)	x 2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

---

2. Ventilation rate

---

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		75.2000 (23c)

Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
GLAZING			8.3600	0.8687	7.2625			(27)
OPAQUE			2.6400	0.9000	2.3760			(26)
DOOR TO CORRIDOR			2.2000	0.9000	1.9800			(26)
External Wall 1	29.1500	11.0000	18.1500	0.1200	2.1780			(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1200	2.1984			(29a)
Total net area of external elements Aum(A, m2)			49.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.9949			(33)
Main dwelling								
Party Wall 1			33.5000	0.0000	0.0000			(32)
Party Floor 1			52.4000					(32d)
Party Ceiling 1			52.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	23.8000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	24.9900	0.0700	1.7493
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.8000	0.0800	0.9440
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0800	0.4320
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E2 Other lintels (including other steel lintels)	6.4000	0.2000	1.2800
E3 Sill	3.8000	0.0400	0.1520
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4443 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 22.4392 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7095	12.5738	12.4381	11.7596	11.6240	10.9455	10.9455	10.8098	11.2169	11.6240	11.8953	12.1667	(38)
Heat transfer coeff	35.1487	35.0130	34.8773	34.1989	34.0632	33.3848	33.3848	33.2491	33.6561	34.0632	34.3346	34.6060	(39)
Average = Sum(39)m / 12 =												34.1650	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6708	0.6682	0.6656	0.6527	0.6501	0.6371	0.6371	0.6345	0.6423	0.6501	0.6552	0.6604	(40)
HLP (average)												0.6520	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)
Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)											Total = Sum(45)m =	1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.0285	(64)
12Total per year (kWh/year)												2274	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.9762	50.2737	49.4760	51.5192	52.1756	58.3828	62.3342	69.6725	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8004	89.4575	80.8004	83.4937	80.8004	83.4937	80.8004	80.8004	83.4937	80.8004	83.4937	80.8004	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	75.2368	69.8245	66.5000	69.2462	72.4661	78.4716	86.5753	93.6458	(72)
Total internal gains	381.4033	389.6512	373.1243	358.8210	340.1656	324.3111	311.5220	312.6757	322.6019	337.4572	359.0384	373.5512	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.2000	36.7938	0.3000	0.8000	0.7700	13.4630	(77)
Southwest	6.1600	36.7938	0.3000	0.8000	0.7700	37.6964	(79)

Solar gains	51.1594	87.1435	119.2335	147.7361	165.4767	164.2801	158.3835	145.1482	129.1046	96.3121	61.2772	43.7818	(83)
Total gains	432.5628	476.7946	492.3578	506.5570	505.6423	488.5911	469.9055	457.8239	451.7065	433.7693	420.3156	417.3330	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	103.5284	103.9296	104.3339	106.4037	106.8276	108.9985	108.9985	109.4433	108.1196	106.8276	105.9832	105.1521	
alpha	7.9019	7.9286	7.9556	8.0936	8.1218	8.2666	8.2666	8.2962	8.2080	8.1218	8.0655	8.0101	
util living area	0.9748	0.9473	0.8999	0.7823	0.6212	0.4370	0.3126	0.3340	0.5130	0.7824	0.9374	0.9791	(86)
MIT	20.6294	20.7488	20.8594	20.9606	20.9939	20.9997	21.0000	21.0000	20.9989	20.9665	20.8128	20.6120	(87)
Th 2	20.3667	20.3690	20.3713	20.3828	20.3852	20.3967	20.3967	20.3990	20.3921	20.3852	20.3805	20.3759	(88)
util rest of house	0.9686	0.9359	0.8804	0.7506	0.5819	0.3960	0.2697	0.2904	0.4683	0.7454	0.9223	0.9739	(89)
MIT 2	19.9476	20.0945	20.2264	20.3468	20.3806	20.3966	20.3967	20.3990	20.3914	20.3563	20.1835	19.9340	(90)
Living area fraction										fLA = Living area / (4) =		0.4752	(91)
MIT	20.2716	20.4054	20.5272	20.6385	20.6720	20.6832	20.6834	20.6846	20.6801	20.6463	20.4825	20.2562	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1216	20.2554	20.3772	20.4885	20.5220	20.5332	20.5334	20.5346	20.5301	20.4963	20.3325	20.1062	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9336	0.8806	0.7562	0.5908	0.4053	0.2794	0.3003	0.4785	0.7523	0.9210	0.9713	(94)
Useful gains	417.7849	445.1416	433.5623	383.0580	298.7104	198.0098	131.3124	137.4667	216.1437	326.3258	387.1248	405.3569	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	556.1075	537.6395	483.9997	396.3129	300.5067	198.0774	131.3149	137.4712	216.4125	337.0983	454.3331	550.4486	(97)
Space heating kWh	102.9120	62.1586	37.5254	9.5436	1.3365	0.0000	0.0000	0.0000	0.0000	8.0148	48.3899	107.9483	(98a)
Space heating requirement - total per year (kWh/year)												377.8291	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	102.9120	62.1586	37.5254	9.5436	1.3365	0.0000	0.0000	0.0000	0.0000	8.0148	48.3899	107.9483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												377.8291	
Space heating per m2											(98c) / (4) =	7.2105	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 298.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	102.9120	62.1586	37.5254	9.5436	1.3365	0.0000	0.0000	0.0000	0.0000	8.0148	48.3899	107.9483	(98)
Space heating efficiency (main heating system 1)	298.0000	298.0000	298.0000	298.0000	298.0000	0.0000	0.0000	0.0000	0.0000	298.0000	298.0000	298.0000	(210)
Space heating fuel (main heating system)	34.5342	20.8586	12.5924	3.2025	0.4485	0.0000	0.0000	0.0000	0.0000	2.6895	16.2382	36.2242	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	224.6039	198.8223	211.4950	186.3671	180.9933	163.4350	161.4439	167.5889	169.1551	188.2314	199.7073	222.1853	(64)
Efficiency of water heater												288.0000	(216)
(217)m	291.0691	290.3204	289.4638	288.4716	288.0709	288.0000	288.0000	288.0000	288.0000	288.3952	289.8974	291.1952	(217)
Fuel for water heating, kWh/month	59.6577	52.6298	55.4598	47.5097	45.1397	39.6250	38.3628	40.4965	41.6111	47.5987	51.8777	58.8012	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	63.2662	57.1437	63.2662	61.2254	63.2662	61.2254	63.2662	63.2662	61.2254	63.2662	61.2254	63.2662	(231)
Lighting	16.7887	13.4685	12.1269	8.8847	6.8628	5.6070	6.2605	8.1376	10.5699	13.8683	15.6643	17.2553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 126.7883 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 288.0000
Water heating fuel used 578.7699 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)
mechanical ventilation fans (SFP = 0.6020) 103.9086 (230a)
central heating pump 41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler 600.0000 (230f)
Total electricity for the above, kWh/year 744.9086 (231)
Electricity for lighting (calculated in Appendix L) 135.4946 (232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1585.9613	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	126.7883	0.2100	26.6255	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	578.7699	0.2100	121.5417	(264)
Space and water heating			148.1672	(265)
Pumps, fans and electric keep-hot	744.9086	0.1387	103.3280	(267)
Energy for lighting	135.4946	0.1443	19.5561	(268)
Total CO2, kg/year			271.0513	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	126.7883	1.1300	143.2708	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	578.7699	1.1300	654.0100	(278)
Space and water heating			797.2807	(279)
Pumps, fans and electric keep-hot	744.9086	1.5128	1126.8977	(281)
Energy for lighting	135.4946	1.5338	207.8261	(282)
Total Primary energy kWh/year			2132.0046	(286)
Dwelling Primary energy Rate (DPER)			40.6900	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4000	(1b) x	2.7000	(2b) =	141.4800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.4800	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1414	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3914	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3033	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3867	0.3791	0.3715	0.3336	0.3261	0.2881	0.2881	0.2806	0.3033	0.3261	0.3412	0.3564	(22b)
Effective ac	0.5748	0.5719	0.5690	0.5557	0.5532	0.5415	0.5415	0.5394	0.5460	0.5532	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.8400	1.0000	4.8400			(26)
TER Opening Type			8.2600	1.1450	9.4580			(27)

External Wall 1	29.1500	10.9000	18.2500	0.1800	3.2850		(29a)
EXPOSED WALL TO CORRIDOR	20.5200	2.2000	18.3200	0.1800	3.2976		(29a)
Total net area of external elements Aum(A, m2)			49.6700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.8806		(33)
Main dwelling							
Party Wall 1			33.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	23.8000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	24.9900	0.0700	1.7493
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.8000	0.0200	0.2360
E16 Corner (normal)	5.4000	0.0900	0.4860
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	5.4000	0.0600	0.3240
E18 Party wall between dwellings	5.4000	0.0600	0.3240
E2 Other lintels (including other steel lintels)	6.4000	0.0500	0.3200
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	26.4000	0.0500	1.3200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.7063 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.5869 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.8353	26.6997	26.5669	25.9427	25.8260	25.2824	25.2824	25.1817	25.4917	25.8260	26.0622	26.3091	(38)
Heat transfer coeff	52.4222	52.2866	52.1538	51.5296	51.4129	50.8693	50.8693	50.7686	51.0787	51.4129	51.6491	51.8961	(39)

Average = Sum(39)m / 12 = 51.5291

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0004	0.9978	0.9953	0.9834	0.9812	0.9708	0.9708	0.9689	0.9748	0.9812	0.9857	0.9904	(40)
HLP (average)												0.9834	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7609 (42)

Hot water usage for mixer showers

53.7435	52.9359	51.7589	49.5071	47.8453	45.9921	44.9387	46.1068	47.3871	49.3769	51.6771	53.5376	(42a)

Hot water usage for baths

23.2347	22.8896	22.4037	21.5077	20.8369	20.0929	19.6911	20.1737	20.6990	21.4950	22.4095	23.1562	(42b)

Hot water usage for other uses

32.6631	31.4753	30.2876	29.0998	27.9121	26.7243	26.7243	27.9121	29.0998	30.2876	31.4753	32.6631	(42c)

Average daily hot water use (litres/day) 100.7857 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.6413	107.3008	104.4502	100.1147	96.5943	92.8094	91.3542	94.1925	97.1860	101.1595	105.5619	109.3568	(44)
Energy conte	173.6450	152.7949	160.5361	137.0520	130.0344	114.1200	110.4850	116.6300	119.8400	137.2725	150.3922	171.2264	(45)
Energy content (annual)										Total = Sum(45)m =		1674.0285	
Distribution loss (46)m = 0.15 x (45)m	26.0467	22.9192	24.0804	20.5578	19.5052	17.1180	16.5727	17.4945	17.9760	20.5909	22.5588	25.6840	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.2234	45.7690	46.5531	47.9995	47.9273	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	224.6039	198.8223	211.4950	186.3671	179.2578	159.8890	157.0381	164.6294	167.7674	188.2314	199.7073	222.1853	(62)
WWHRS	-24.5693	-21.7293	-22.7537	-18.8409	-17.5591	-15.0254	-14.0839	-14.9768	-15.5459	-18.3269	-20.7621	-24.1143	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
									Total per year (kWh/year) = Sum(64)m =			2031.7064	(64)
12Total per year (kWh/year)												2032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	70.4767	62.3112	66.1180	57.8986	55.5423	49.3871	48.3745	50.7793	51.8286	58.3828	62.3342	69.6725	(65)

---

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	88.0435	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9944	89.6723	80.9944	83.6942	80.9944	83.6942	80.9944	80.9944	83.6942	80.9944	83.6942	80.9944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.4632	155.0556	151.0427	142.4995	131.7154	121.5798	114.8086	113.2161	117.2291	125.7722	136.5564	146.6920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	31.8044	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	-70.4348	(71)
Water heating gains (Table 5)	94.7267	92.7249	88.8682	80.4147	74.6536	68.5933	65.0195	68.2518	71.9842	78.4716	86.5753	93.6458	(72)
Total internal gains	381.5973	389.8660	373.3183	359.0214	339.7764	323.2803	310.2355	311.8753	322.3205	337.6512	359.2389	373.7452	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southeast			2.1700		36.7938		0.6300		0.7000		0.7700	24.4009	(77)
Southwest			6.0900		36.7938		0.6300		0.7000		0.7700	68.4801	(79)
Solar gains	92.8810	158.2107	216.4708	268.2178	300.4263	298.2538	287.5485	263.5195	234.3921	174.8565	111.2500	79.4868	(83)
Total gains	474.4783	548.0767	589.7891	627.2392	640.2027	621.5340	597.7840	575.3948	556.7126	512.5077	470.4889	453.2320	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4150	69.5950	69.7723	70.6174	70.7778	71.5341	71.5341	71.6760	71.2409	70.7778	70.4541	70.1188	
alpha	5.6277	5.6397	5.6515	5.7078	5.7185	5.7689	5.7689	5.7784	5.7494	5.7185	5.6969	5.6746	
util living area	0.9852	0.9671	0.9332	0.8484	0.7054	0.5177	0.3736	0.4046	0.6155	0.8686	0.9670	0.9881	(86)
MIT	20.1419	20.3440	20.5667	20.8072	20.9440	20.9920	20.9990	20.9984	20.9793	20.8110	20.4455	20.1066	(87)
Th 2	20.0830	20.0851	20.0873	20.0972	20.0991	20.1077	20.1077	20.1094	20.1044	20.0991	20.0953	20.0914	(88)
util rest of house	0.9809	0.9581	0.9157	0.8132	0.6496	0.4483	0.2983	0.3269	0.5427	0.8299	0.9565	0.9846	(89)
MIT 2	19.1061	19.3593	19.6320	19.9160	20.0560	20.1035	20.1074	20.1088	20.0921	19.9283	19.4967	19.0682	(90)
Living area fraction										fLA = Living area / (4) =		0.4752	(91)
MIT	19.5983	19.8272	20.0761	20.3395	20.4779	20.5257	20.5311	20.5315	20.5137	20.3477	19.9476	19.5617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5983	19.8272	20.0761	20.3395	20.4779	20.5257	20.5311	20.5315	20.5137	20.3477	19.9476	19.5617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9780	0.9552	0.9155	0.8233	0.6738	0.4811	0.3341	0.3639	0.5766	0.8415	0.9544	0.9821	(94)
Useful gains	464.0532	523.4984	539.9350	516.3851	431.3656	299.0319	199.7311	209.3607	321.0246	431.2563	449.0405	445.1091	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	801.9727	780.4931	708.0471	589.4741	451.2989	301.4377	199.9714	209.7523	327.6021	501.1596	663.5652	797.2093	(97)
Space heating kWh	251.4121	172.7004	125.0754	52.6241	14.8304	0.0000	0.0000	0.0000	0.0000	52.0081	154.4578	261.9625	(98a)
Space heating requirement - total per year (kWh/year)												1085.0707	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	251.4121	172.7004	125.0754	52.6241	14.8304	0.0000	0.0000	0.0000	0.0000	52.0081	154.4578	261.9625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1085.0707	
Space heating per m2											(98c) / (4) =	20.7075	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	251.4121	172.7004	125.0754	52.6241	14.8304	0.0000	0.0000	0.0000	0.0000	52.0081	154.4578	261.9625	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	272.0910	186.9052	135.3630	56.9524	16.0502	0.0000	0.0000	0.0000	0.0000	56.2858	167.1621	283.5093	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	200.0346	177.0930	188.7413	167.5261	161.6987	144.8636	142.9542	149.6526	152.2215	169.9046	178.9452	198.0710	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.8724	84.3276	83.5202	82.2008	80.9579	80.3000	80.3000	80.3000	80.3000	82.1628	84.0676	84.9813	(217)
Fuel for water heating, kWh/month	235.6887	210.0060	225.9828	203.8011	199.7318	180.4029	178.0251	186.3669	189.5660	206.7902	212.8587	233.0758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8290	13.5009	12.1560	8.9060	6.8793	5.6204	6.2755	8.1571	10.5953	13.9016	15.7019	17.2968	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0245	-26.3361	-39.2267	-45.7721	-50.8307	-48.0133	-47.4576	-44.0915	-38.3726	-30.8845	-20.1532	-15.4794	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.5501	-16.1261	-32.4983	-49.4567	-66.0099	-66.5214	-65.7070	-55.3250	-40.1678	-23.2390	-10.1402	-5.9501	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1174.3190	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2462.2960	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.8199	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.3338	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2995.1011	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1174.3190	0.2100	246.6070	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2462.2960	0.2100	517.0822	(264)
Space and water heating			763.6891	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.8199	0.1443	19.6030	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6423	0.1338	-56.8242	
PV Unit electricity exported	-438.6915	0.1255	-55.0660	
Total			-111.8902	(269)
Total CO2, kg/year			683.3313	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1174.3190	1.1300	1326.9805	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2462.2960	1.1300	2782.3944	(278)
Space and water heating			4109.3749	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.8199	1.5338	208.3251	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-424.6423	1.4945	-634.6363	
PV Unit electricity exported	-438.6915	0.4607	-202.1227	
Total			-836.7590	(283)
Total Primary energy kWh/year			3611.0418	(286)
Target Primary Energy Rate (TPER)			68.9100	(287)

Full SAP Calculation Printout

Property Reference	Studio	**Issued on Date**	17/06/2025
Assessment Reference	Studio	**Prop Type Ref**	
Property			

SAP Rating	89 B	**DER**	6.88	**TER**	31.48
Environmental	97 A	**% DER < TER**			78.14
CO_2 Emissions (t/year)	0.14	**DFEE**	61.75	**TFEE**	75.92
Compliance Check	See BREL	**% DFEE < TFEE**			18.66
% DPER < TPER	76.49	**DPER**	39.82	**TPER**	169.42

Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	22.6900	(1b)	x 2.7000	(2b) =	61.2630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	22.6900					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		61.2630	(5)

---

2. Ventilation rate

---

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.2000	(23c)
Effective ac	0.2722	0.2693	0.2664	0.2519	0.2490	0.2344	0.2344	0.2315	0.2402	0.2490	0.2548	0.2606	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			5.9400	0.8687	5.1602			(27)
Door to Corridor			2.2000	0.9000	1.9800			(26)
Ground Floor			22.6900	0.0900	2.0421			(28a)
External Wall	17.6600	6.1600	11.5000	0.1200	1.3800			(29a)
Internal Exposed Wall	35.5300	1.9800	33.5500	0.1200	4.0260			(29a)
External Roof 1	6.4000		6.4000	0.1000	0.6400			(30)
Total net area of external elements Aum(A, m2)			82.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.2283			(33)
Main dwelling								
Party Ceiling 1			16.2900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	19.7000	0.1300	2.5610

E16 Corner (normal)	10.8000	0.0900	0.9720	
P8 Party Wall - Exposed floor (inverted)	12.5500	0.2400	3.0120	
E14 Flat roof	3.5000	0.0800	0.2800	
E15 Flat roof with parapet	3.6500	0.0800	0.2920	
E24 Eaves (insulation at ceiling level - inverted)	3.6600	0.2400	0.8784	
E2 Other lintels (including other steel lintels)	3.7000	0.2000	0.7400	
E3 Sill	2.7000	0.0400	0.1080	
E4 Jamb	17.6000	0.0500	0.8800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7234 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.9517 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	5.5034	5.4446	5.3859	5.0921	5.0333	4.7396	4.7396	4.6808	4.8571	5.0333	5.1509	5.2684	(38)
Heat transfer coeff	30.4551	30.3964	30.3376	30.0438	29.9851	29.6913	29.6913	29.6326	29.8088	29.9851	30.1026	30.2201	(39)
Average = Sum(39)m / 12 =												30.0291	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3422	1.3396	1.3370	1.3241	1.3215	1.3086	1.3086	1.3060	1.3137	1.3215	1.3267	1.3319	(40)
HLP (average)												1.3235	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.0583 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

48.2754	47.5585	46.5488	44.6873	43.2933	41.7477	40.9128	41.9154	43.0070	44.6609	46.5608	48.1122	(42b)

Hot water usage for other uses

25.4676	24.5415	23.6154	22.6893	21.7632	20.8371	20.8371	21.7632	22.6893	23.6154	24.5415	25.4676	(42c)

Average daily hot water use (litres/day) 67.9112 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.7430	72.0999	70.1642	67.3765	65.0565	62.5848	61.7499	63.6786	65.6963	68.2762	71.1022	73.5798	(44)
Energy conte	116.7908	102.6693	107.8398	92.2351	87.5786	76.9553	74.6812	78.8474	81.0101	92.6502	101.2982	115.2081	(45)
Energy content (annual)										Total = Sum(45)m =		1127.7640	
Distribution loss (46)m = 0.15 x (45)m	17.5186	15.4004	16.1760	13.8353	13.1368	11.5433	11.2022	11.8271	12.1515	13.8975	15.1947	17.2812	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	167.7497	148.6967	158.7987	141.5502	138.5375	126.2704	125.6401	129.8063	130.3251	143.6091	150.6133	166.1670	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	167.7497	148.6967	158.7987	141.5502	138.5375	126.2704	125.6401	129.8063	130.3251	143.6091	150.6133	166.1670	(64)
										Total per year (kWh/year) = Sum(64)m =		1727.7640	(64)
12Total per year (kWh/year)												1728	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	51.5727	45.6444	48.5964	42.9969	41.8596	37.9164	37.5712	38.9565	39.2646	43.5459	46.0104	51.0464	(65)

---

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.0364	45.4332	41.0364	42.4043	41.0364	42.4043	41.0364	41.0364	42.4043	41.0364	42.4043	41.0364	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	81.3593	82.2035	80.0760	75.5469	69.8296	64.4561	60.8663	60.0221	62.1496	66.6788	72.3961	77.7695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	(71)
Water heating gains (Table 5)	69.3181	67.9232	65.3178	59.7180	56.2629	52.6617	50.4989	52.3609	54.5342	58.5295	63.9034	68.6108	(72)
Total internal gains	233.5876	237.4337	228.3040	219.5429	209.0027	198.3959	191.2755	192.2931	197.9618	208.1184	220.5775	229.2905	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.9800	36.7938	0.3000	0.8000	0.7700	12.1167	(77)
Southwest	1.9800	36.7938	0.3000	0.8000	0.7700	12.1167	(79)
Northwest	1.9800	11.2829	0.3000	0.8000	0.7700	3.7156	(81)

Solar gains	27.9490	48.8417	70.1056	92.3590	108.4652	109.8869	105.0246	92.6714	77.7590	54.8644	33.7013	23.7731	(83)
Total gains	261.5366	286.2754	298.4096	311.9019	317.4678	308.2828	296.3001	284.9646	275.7209	262.9828	254.2787	253.0636	(84)

---

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	51.7382	51.8383	51.9386	52.4465	52.5493	53.0692	53.0692	53.1744	52.8600	52.5493	52.3441	52.1406	
alpha	4.4492	4.4559	4.4626	4.4964	4.5033	4.5379	4.5379	4.5450	4.5240	4.5033	4.4896	4.4760	
util living area	0.9741	0.9598	0.9353	0.8747	0.7616	0.5881	0.4348	0.4694	0.6832	0.8805	0.9552	0.9773	(86)
MIT	19.8414	20.0199	20.2654	20.5846	20.8301	20.9600	20.9918	20.9884	20.9206	20.6321	20.1965	19.8093	(87)
Th 2	19.8079	19.8099	19.8119	19.8220	19.8240	19.8341	19.8341	19.8362	19.8301	19.8240	19.8200	19.8160	(88)
util rest of house	0.9665	0.9482	0.9163	0.8382	0.6967	0.4927	0.3228	0.3552	0.5904	0.8383	0.9402	0.9705	(89)
MIT 2	18.5221	18.7448	19.0473	19.4300	19.6922	19.8134	19.8318	19.8326	19.7829	19.4941	18.9752	18.4880	(90)
Living area fraction									fLA = Living area / (4) =			1.0000	(91)
MIT	19.8414	20.0199	20.2654	20.5846	20.8301	20.9600	20.9918	20.9884	20.9206	20.6321	20.1965	19.8093	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6914	19.8699	20.1154	20.4346	20.6801	20.8100	20.8418	20.8384	20.7706	20.4821	20.0465	19.6593	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9656	0.9489	0.9217	0.8583	0.7452	0.5733	0.4200	0.4540	0.6663	0.8635	0.9435	0.9695	(94)
Useful gains	252.5415	271.6422	275.0415	267.7186	236.5904	176.7482	124.4382	129.3822	183.7213	227.0836	239.9062	245.3364	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	468.7454	455.0306	413.0586	346.5432	269.2702	184.3834	125.9432	131.5200	198.8431	296.3169	389.7230	467.1808	(97)
Space heating kWh	160.8557	123.2370	102.6847	56.7538	24.3138	0.0000	0.0000	0.0000	0.0000	51.5096	107.8681	165.0522	(98a)
Space heating requirement - total per year (kWh/year)												792.2749	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	160.8557	123.2370	102.6847	56.7538	24.3138	0.0000	0.0000	0.0000	0.0000	51.5096	107.8681	165.0522	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												792.2749	
Space heating per m2										(98c) / (4) =		34.9174	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												286.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	160.8557	123.2370	102.6847	56.7538	24.3138	0.0000	0.0000	0.0000	0.0000	51.5096	107.8681	165.0522	(98)
Space heating efficiency (main heating system 1)	286.0000	286.0000	286.0000	286.0000	286.0000	0.0000	0.0000	0.0000	0.0000	286.0000	286.0000	286.0000	(210)
Space heating fuel (main heating system)	56.2433	43.0899	35.9037	19.8440	8.5013	0.0000	0.0000	0.0000	0.0000	18.0103	37.7161	57.7106	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	167.7497	148.6967	158.7987	141.5502	138.5375	126.2704	125.6401	129.8063	130.3251	143.6091	150.6133	166.1670	(64)
Efficiency of water heater												286.0000	(216)
(217)m	286.0000	286.0000	286.0000	286.0000	286.0000	286.0000	286.0000	286.0000	286.0000	286.0000	286.0000	286.0000	(217)
Fuel for water heating, kWh/month	40.8360	35.8984	37.7062	32.2500	30.6219	26.9074	26.1123	27.5690	28.3252	32.3952	35.4189	40.2826	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	57.9959	52.3834	57.9959	56.1251	57.9959	56.1251	57.9959	57.9959	56.1251	57.9959	56.1251	57.9959	(231)
Lighting	10.3120	8.2727	7.4486	5.4572	4.2153	3.4439	3.8453	4.9983	6.4923	8.5182	9.6213	10.5986	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.0269	-47.1014	-64.8861	-69.6993	-72.9917	-68.4704	-68.6807	-66.5600	-61.2226	-53.7642	-38.1357	-30.5823	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												277.0192	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												286.0000	
Water heating fuel used												394.3231	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.5600)													
mechanical ventilation fans (SFP = 0.5600)												41.8549	(230a)
central heating pump												41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler												600.0000	(230f)
Total electricity for the above, kWh/year												682.8549	(231)
Electricity for lighting (calculated in Appendix L)												83.2236	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													

PV generation	-677.1212	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	760.2995	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	277.0192	0.2100	58.1740	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	394.3231	0.2100	82.8078	(264)
Space and water heating			140.9819	(265)
Pumps, fans and electric keep-hot	682.8549	0.1387	94.7204	(267)
Energy for lighting	83.2236	0.1443	12.0117	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-677.1212	0.1353	-91.5943	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-91.5943	(269)
Total CO2, kg/year			156.1197	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	277.0192	1.1300	313.0317	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	394.3231	1.1300	445.5851	(278)
Space and water heating			758.6168	(279)
Pumps, fans and electric keep-hot	682.8549	1.5128	1033.0229	(281)
Energy for lighting	83.2236	1.5338	127.6512	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-677.1212	1.5000	-1015.6628	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1015.6628	(283)
Total Primary energy kWh/year			903.6280	(286)
Dwelling Primary energy Rate (DPER)			39.8200	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	22.6900	(1b)	x 2.7000	(2b) =	61.2630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	22.6900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	61.2630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.3265	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.5765	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5696	0.5584	0.5473	0.4914	0.4803	0.4244	0.4244	0.4133	0.4468	0.4803	0.5026	0.5249	(22b)
Effective ac	0.6622	0.6559	0.6498	0.6208	0.6153	0.5901	0.5901	0.5854	0.5998	0.6153	0.6263	0.6378	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type			3.4800	1.1450	3.9847			(27)
Ground Floor			22.6900	0.1300	2.9497			(28a)
External Wall	17.6600	4.5200	13.1400	0.1800	2.3652			(29a)
Internal Exposed Wall	35.5300	1.1600	34.3700	0.1800	6.1866			(29a)
External Roof 1	6.4000		6.4000	0.1100	0.7040			(30)
Total net area of external elements Aum(A, m2)			82.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.3902			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	19.7000	0.1600	3.1520
E16 Corner (normal)	10.8000	0.0900	0.9720
P8 Party Wall - Exposed floor (inverted)	12.5500	0.2400	3.0120
E14 Flat roof	3.5000	0.0800	0.2800
E15 Flat roof with parapet	3.6500	0.5600	2.0440
E24 Eaves (insulation at ceiling level - inverted)	3.6600	0.2400	0.8784
E2 Other lintels (including other steel lintels)	3.7000	0.0500	0.1850
E3 Sill	2.7000	0.0500	0.1350
E4 Jamb	17.6000	0.0500	0.8800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5384 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.9286 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.3882	13.2608	13.1360	12.5496	12.4399	11.9292	11.9292	11.8347	12.1260	12.4399	12.6619	12.8939	(38)
Heat transfer coeff	43.3168	43.1895	43.0646	42.4783	42.3686	41.8579	41.8579	41.7633	42.0546	42.3686	42.5905	42.8225	(39)

Average = Sum(39)m / 12 = 42.4777

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9091	1.9035	1.8980	1.8721	1.8673	1.8448	1.8448	1.8406	1.8534	1.8673	1.8771	1.8873	(40)
HLP (average)												1.8721	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.0583 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

48.2754	47.5585	46.5488	44.6873	43.2933	41.7477	40.9128	41.9154	43.0070	44.6609	46.5608	48.1122	(42b)

Hot water usage for other uses

25.4676	24.5415	23.6154	22.6893	21.7632	20.8371	20.8371	21.7632	22.6893	23.6154	24.5415	25.4676	(42c)

Average daily hot water use (litres/day) 67.9112 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.7430	72.0999	70.1642	67.3765	65.0565	62.5848	61.7499	63.6786	65.6963	68.2762	71.1022	73.5798	(44)
Energy conte	116.7908	102.6693	107.8398	92.2351	87.5786	76.9553	74.6812	78.8474	81.0101	92.6502	101.2982	115.2081	(45)

Energy content (annual) Total = Sum(45)m = 1127.7640

Distribution loss (46)m = 0.15 x (45)m

17.5186	15.4004	16.1760	13.8353	13.1368	11.5433	11.2022	11.8271	12.1515	13.8975	15.1947	17.2812	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 37.5786	33.1857	35.7549	33.2268	33.1521	30.8637	31.4671	32.4499	32.3982	34.7928	35.0641	37.4954	(61)

Total heat required for water heating calculated for each month

154.3694	135.8550	143.5947	125.4619	120.7307	107.8190	106.1482	111.2973	113.4082	127.4431	136.3623	152.7036	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

154.3694	135.8550	143.5947	125.4619	120.7307	107.8190	106.1482	111.2973	113.4082	127.4431	136.3623	152.7036	(64)

Total per year (kWh/year) = Sum(64)m = 1535.1934 (64)

12Total per year (kWh/year) 1535 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

48.2276	42.4340	44.7954	38.9749	37.4079	33.3036	32.6983	34.3292	35.0354	39.5044	42.4477	47.6806	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	52.9126	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.1796	47.8059	43.1796	44.6189	43.1796	44.6189	43.1796	43.1796	44.6189	43.1796	44.6189	43.1796	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	81.3593	82.2035	80.0760	75.5469	69.8296	64.4561	60.8663	60.0221	62.1496	66.6788	72.3961	77.7695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	28.2913	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	-42.3301	(71)
Water heating gains (Table 5)	64.8220	63.1458	60.2089	54.1318	50.2794	46.2550	43.9493	46.1414	48.6603	53.0973	58.9551	64.0868	(72)
Total internal gains	231.2347	235.0290	225.3383	216.1713	205.1623	194.2037	186.8689	188.2169	194.3025	204.8294	217.8438	226.9096	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	1.1600	36.7938	0.6300	0.7000	0.7700	13.0438	(77)
Southwest	1.1600	36.7938	0.6300	0.7000	0.7700	13.0438	(79)
Northwest	1.1600	11.2829	0.6300	0.7000	0.7700	3.9999	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	30.0876	52.5789	75.4698	99.4259	116.7644	118.2949	113.0606	99.7622	83.7088	59.0624	36.2799	25.5921	(83)
Total gains	261.3222	287.6079	300.8080	315.5971	321.9267	312.4987	299.9295	287.9791	278.0113	263.8918	254.1237	252.5017	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.3760	36.4833	36.5891	37.0941	37.1902	37.6439	37.6439	37.7292	37.4678	37.1902	36.9964	36.7959	
alpha	3.4251	3.4322	3.4393	3.4729	3.4793	3.5096	3.5096	3.5153	3.4979	3.4793	3.4664	3.4531	
util living area	0.9802	0.9711	0.9563	0.9200	0.8479	0.7149	0.5659	0.6033	0.7940	0.9251	0.9689	0.9824	(86)
MIT	19.0607	19.2716	19.5996	20.0663	20.4941	20.8135	20.9395	20.9229	20.7092	20.1789	19.5574	19.0367	(87)
Th 2	20.0455	20.0483	20.0510	20.0639	20.0664	20.0776	20.0776	20.0797	20.0733	20.0664	20.0615	20.0564	(88)
util rest of house	0.9766	0.9657	0.9476	0.9030	0.8126	0.6461	0.4648	0.5046	0.7367	0.9059	0.9622	0.9791	(89)
MIT 2	18.2738	18.4842	18.8098	19.2738	19.6783	19.9628	20.0518	20.0446	19.8790	19.3893	18.7785	18.2579	(90)
Living area fraction										fLA = Living area / (4) =		1.0000	(91)
MIT	19.0607	19.2716	19.5996	20.0663	20.4941	20.8135	20.9395	20.9229	20.7092	20.1789	19.5574	19.0367	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0607	19.2716	19.5996	20.0663	20.4941	20.8135	20.9395	20.9229	20.7092	20.1789	19.5574	19.0367	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9719	0.9604	0.9428	0.9030	0.8298	0.7021	0.5597	0.5957	0.7776	0.9085	0.9578	0.9747	(94)
Useful gains	253.9703	276.2200	283.6031	284.9939	267.1287	219.4075	167.8839	171.5504	216.1772	239.7338	243.4026	246.1093	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	639.3878	620.7006	564.1314	474.3247	372.5949	260.0822	181.6402	188.8927	277.9487	405.8428	530.5648	635.3453	(97)
Space heating kWh	286.7506	231.4909	208.7130	136.3181	78.4669	0.0000	0.0000	0.0000	0.0000	123.5850	206.7568	289.5916	(98a)
Space heating requirement - total per year (kWh/year)												1561.6730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	286.7506	231.4909	208.7130	136.3181	78.4669	0.0000	0.0000	0.0000	0.0000	123.5850	206.7568	289.5916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.6730	
Space heating per m2											(98c) / (4) =	68.8265	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.4000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	286.7506	231.4909	208.7130	136.3181	78.4669	0.0000	0.0000	0.0000	0.0000	123.5850	206.7568	289.5916	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	310.3362	250.5313	225.8799	147.5305	84.9209	0.0000	0.0000	0.0000	0.0000	133.7500	223.7628	313.4108	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	154.3694	135.8550	143.5947	125.4619	120.7307	107.8190	106.1482	111.2973	113.4082	127.4431	136.3623	152.7036	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.6885	85.5130	85.1817	84.5597	83.4812	80.3000	80.3000	80.3000	80.3000	84.3156	85.2706	85.7300	(217)
Fuel for water heating, kWh/month	180.1519	158.8706	168.5746	148.3708	144.6202	134.2703	132.1896	138.6018	141.2307	151.1501	159.9171	178.1214	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	8.9719	7.1976	6.4806	4.7480	3.6675	2.9964	3.3456	4.3487	5.6486	7.4112	8.3709	9.2212	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.1805	-12.1598	-18.4334	-21.9249	-24.7454	-23.5564	-23.3207	-21.4908	-18.4167	-14.4720	-9.2307	-7.0049	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.8937	-6.2270	-12.6246	-19.3106	-25.8483	-26.0389	-25.6813	-21.5581	-15.5925	-8.9643	-3.8868	-2.2744	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1690.1223	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	1836.0690	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	72.4080	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-373.8367	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3310.7627	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1690.1223	0.2100	354.9257	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1836.0690	0.2100	385.5745	(264)
Space and water heating			740.5002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	72.4080	0.1443	10.4507	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-202.9361	0.1334	-27.0739	
PV Unit electricity exported	-170.9007	0.1254	-21.4335	
Total			-48.5074	(269)
Total CO2, kg/year			714.3728	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			31.4800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1690.1223	1.1300	1909.8382	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1836.0690	1.1300	2074.7580	(278)
Space and water heating			3984.5962	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	72.4080	1.5338	111.0619	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-202.9361	1.4930	-302.9830	
PV Unit electricity exported	-170.9007	0.4603	-78.6724	
Total			-381.6554	(283)
Total Primary energy kWh/year			3844.1035	(286)
Target Primary Energy Rate (TPER)			169.4200	(287)

Energy Assessment
Wellington Road

+44 (0)20 7043 0418
info@eightversa.com

Be Green – Block compliance report

Block Compliance

Block Reference	11260 Wellington Rd RKS Green	**Issued on Date**	02/06/2025
Block Name	11260 Wellington Rd		
Calculation Type	New Build (As Designed)		
Assessor Details	Ms. Vanessa Vienna	**Assessor ID**	T798-0001
Client			

Block Compliance Report - DER

Block Reference: 11260 Wellington Rd RKS Green | **Block Name: 11260 Wellington Rd**

Property-Assessment Reference	Floor area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)	% DER/TER
FLAT 1 - Flat 1	50.58	2.16	18.20	88.13 %
FLAT 10 - FLAT 10	52.43	2.19	12.44	82.40 %
FLAT 11 - Flat 11	52.43	2.18	12.45	82.49 %
FLAT 12 - Flat 12	60.03	1.54	12.82	87.99 %
FLAT 13 - Flat 13	53.85	1.97	15.89	87.60 %
FLAT 14 - Flat 14	51.16	2.46	18.18	86.47 %
FLAT 15 - Flat 15	50.58	2.13	15.91	86.61 %
FLAT 16 - Flat 16	77.60	1.72	13.01	86.78 %
FLAT 17 - FLAT 17	52.40	1.90	14.25	86.67 %
FLAT 18 - FLAT 18	52.43	1.91	14.11	86.46 %
FLAT 19 - FLAT 19	52.43	1.91	14.11	86.46 %
FLAT 2 - Flat 2	53.72	1.99	16.63	88.03 %
FLAT 20 - Flat 20	60.00	1.85	13.97	86.76 %
FLAT 21 - Flat 21	67.26	2.10	15.14	86.13 %
FLAT 3 - Flat 3	52.40	1.43	14.80	90.34 %
FLAT 4 - Flat 4	52.40	1.74	14.58	88.07 %
FLAT 5 - FLAT 5	52.40	1.74	14.58	88.07 %
FLAT 6 - Flat 6	60.03	1.67	13.80	87.90 %
FLAT 7 - Flat 7	50.58	1.77	14.82	88.06 %
flat 8 - Flat 8	77.69	1.64	8.56	80.84 %
FLAT 9 - Flat 9	52.40	5.17	13.04	60.35 %
Studio - Studio	22.69	6.88	31.48	78.14 %

Block Compliance

Totals:	1207.49	50.05	332.77	
Average DER = 2.12 kgCO₂/m²	**% DER/TER**	PASS		
Average TER = 14.51 kgCO₂/m²	85.36 %			

Block Compliance Report - DFEE

Block Reference: 11260 Wellington Rd RKS Green	**Block Name: 11260 Wellington Rd**			
Property-Assessment Reference	**Floor area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
FLAT 1 - Flat 1	50.58	45.45	52.39	13.25 %
FLAT 10 - FLAT 10	52.43	25.72	26.69	3.66 %
FLAT 11 - Flat 11	52.43	25.80	26.71	3.41 %
FLAT 12 - Flat 12	60.03	31.67	31.55	-0.37 %
FLAT 13 - Flat 13	53.85	41.90	43.38	3.40 %
FLAT 14 - Flat 14	51.16	53.17	52.66	-0.96 %
FLAT 15 - Flat 15	50.58	44.76	42.06	-6.41 %
FLAT 16 - Flat 16	77.60	38.44	38.43	-0.02 %
FLAT 17 - FLAT 17	52.40	39.64	35.12	-12.87 %
FLAT 18 - FLAT 18	52.43	39.83	34.48	-15.51 %
FLAT 19 - FLAT 19	52.43	39.83	34.48	-15.51 %
FLAT 2 - Flat 2	53.72	42.22	46.50	9.22 %
FLAT 20 - Flat 20	60.00	39.40	37.05	-6.35 %
FLAT 21 - Flat 21	67.26	46.56	45.13	-3.17 %
FLAT 3 - Flat 3	52.40	34.71	37.66	7.84 %
FLAT 4 - Flat 4	52.40	34.91	36.67	4.80 %
FLAT 5 - FLAT 5	52.40	34.91	36.67	4.81 %
FLAT 6 - Flat 6	60.03	35.33	36.07	2.05 %
FLAT 7 - Flat 7	50.58	34.66	37.04	6.44 %
flat 8 - Flat 8	77.69	36.31	37.57	3.35 %

Block Compliance

FLAT 9 - Flat 9	52.40	25.80	26.91	4.13 %
Studio - Studio	22.69	61.75	75.92	18.66 %
Totals:	1207.49	852.76	871.17	
Average DFEE = 38.15 kWh/m²/yr	**% DFEE/TFEE**	PASS		
Average TFEE = 38.60 kWh/m²/yr	1.15 %			

Block Compliance Report - DPER

Block Reference: 11260 Wellington Rd RKS Green	**Block Name: 11260 Wellington Rd**			
Property-Assessment Reference	**Floor area (m^2)**	**DPER ($kWh/m^2/yr$)**	**TPER ($kWh/m^2/yr$)**	**% DPER/TPER**
FLAT 1 - Flat 1	50.58	21.54	96.70	77.72 %
FLAT 10 - FLAT 10	52.43	22.28	65.69	66.08 %
FLAT 11 - Flat 11	52.43	22.18	65.71	66.25 %
FLAT 12 - Flat 12	60.03	15.31	67.71	77.39 %
FLAT 13 - Flat 13	53.85	19.64	84.24	76.69 %
FLAT 14 - Flat 14	51.16	24.64	96.59	74.49 %
FLAT 15 - Flat 15	50.58	21.25	84.39	74.82 %
FLAT 16 - Flat 16	77.60	17.25	68.49	74.81 %
FLAT 17 - FLAT 17	52.40	18.96	75.42	74.86 %
FLAT 18 - FLAT 18	52.43	19.04	74.65	74.49 %
FLAT 19 - FLAT 19	52.43	19.04	74.65	74.49 %
FLAT 2 - Flat 2	53.72	19.90	88.23	77.45 %
FLAT 20 - Flat 20	60.00	18.47	73.81	74.98 %
FLAT 21 - Flat 21	67.26	21.06	79.99	73.67 %
FLAT 3 - Flat 3	52.40	13.98	78.36	82.16 %
FLAT 4 - Flat 4	52.40	17.33	77.19	77.55 %
FLAT 5 - FLAT 5	52.40	17.33	77.20	77.55 %
FLAT 6 - Flat 6	60.03	16.66	72.97	77.17 %
FLAT 7 - Flat 7	50.58	17.66	78.53	77.51 %
flat 8 - Flat 8	77.69	16.37	45.89	64.33 %

Block Compliance

FLAT 9 - Flat 9	52.40	40.69	68.91	40.95 %
Studio - Studio	22.69	39.82	169.42	76.50 %
Totals:	1207.49	460.40	1764.74	
Average DPER = 20.21 kWh/m²/yr	**% DPER/TPER**	PASS		
Average TPER = 76.86 kWh/m²/yr	73.70 %			