



The PES

Energy & Sustainability Statement

12th January 2026

**Land at West Hoathly Brickworks
Hamsey Road
Sharpthorne
Sussex
RH19 4PB**

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1.0 Executive summary

The proposed development project at West Hoathly Brickworks involves the demolition of existing structures and redevelopment of the site to provide residential dwellings.

It has been designed to achieve the highest of environmental performance standards following the Energy Hierarchy to meet with Mid Sussex District Council local plan policies.

The PES Ltd have been appointed to develop a strategy and advise how the proposed development of new build apartments and commercial will comply with these requirements.

A 'Lean, Clean, Green' has been adopted and the development achieves an overall improvement (DER/TER) in regulated emissions at over **64.56%** above Part L 2021 standard, through the adoption of very high standards of insulation and heat pump driven heating and hot water systems..

In addition, highly sustainable construction techniques, best practice construction practices as well as the selection of materials able to demonstrate responsible sourcing exemplify the overall sustainable credentials of the proposed development.

1.0 The Site & Proposal

The Site is located on the northern edge of the village of Sharpthorne and comprises a former brickworks with expansive areas of hardstanding yard and open storage, and a variety of buildings including offices, manufacturing and storage sheds. The Site constitutes previously developed land. Vehicular and pedestrian access into the Site is from Hamsey Road.

The project is a Full planning application for the demolition of existing structures and redevelopment of the Site to provide residential dwellings (Class C3) and associated works, including the provision of an onsite SANG, access, landscaping, parking and associated works.

1.1 Planning Context

The project sits within the borough boundaries of Mid Sussex District Council (MSDC).

The adopted statutory Development Plan comprises:

- The Mid Sussex District Plan 2014 – 2031 (2018);
- Site Allocations Development Plan Document ("DPD") (2022); and
- The West Hoathly Neighbourhood Plan 2014 – 2031 (2015)

The key policy areas considered with this report are:-

The Mid Sussex District Plan 2014 – 2031 adopted March 2018

DP39: Sustainable Design and Construction

Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change.

Evidence Base: Gatwick Sub Region Water Cycle Study; West Sussex Sustainable Energy Study, Mid Sussex Sustainable Energy Study.

All development proposals must seek to improve the sustainability of development and should where appropriate and feasible according to the type and size of development and location, incorporate the following measures:

- Minimise energy use through the design and layout of the scheme including through the use of natural lighting and ventilation;
- Explore opportunities for efficient energy supply through the use of communal heating networks where viable and feasible;
- Use renewable sources of energy;
- Maximise efficient use of resources, including minimising waste and maximising recycling/re-use of materials through both construction and occupation;
- Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment;

- Demonstrate how the risks associated with future climate change have been planned for as part of the layout of the scheme and design of its buildings to ensure its longer term resilience

1.2 Assessment Methodology

In order to assess the overall development strategy in terms of energy efficiency and carbon emission reduction and align with MSDC Policy DP39, this report will adopt the methodology set out in the "energy hierarchy"

This methodology ensures that development proposals make the fullest contribution to minimising carbon dioxide emission by following energy hierarchy:

- 1 Be lean: use less energy through passive design measures including the maximisation of solar heating and reducing heat loss
- 2 Be clean: supply energy efficiently; considering the potential for CHP or district heating
- 3 Be green: use renewable and low carbon energies.

Accordingly, this energy and sustainability statement has been prepared to meet to meet the requirements of the above policies/requirements in line with the energy hierarchy.

3.0 Baseline energy results

The first stage of the energy hierarchy is to establish the baseline energy model.

The following section details the baseline energy requirements for the development – the starting point when considering the energy hierarchy.

2.1 New Build Dwellings

The baseline emission levels – the Target Emission Rate (TER) – is obtained by applying the design to a reference 'notional' building the characteristics of which are set by regulations – SAP10.2; The new Part L Building Regulations 2021 came into force in June 2022 and introduced a completely new notional dwelling as detailed below:-

Table 1.1 Summary of notional dwelling specification for new dwelling ⁽¹⁾	
Element or system	Reference value for target setting
Opening areas (windows, roof windows, rooflights and doors)	Same as for actual dwelling not exceeding a total area of openings of 25% of total floor area ⁽²⁾
External walls including semi-exposed walls	$U = 0.18 \text{ W/(m}^2\text{K)}$
Party walls	$U = 0$
Floors	$U = 0.13 \text{ W/(m}^2\text{K)}$
Roofs	$U = 0.11 \text{ W/(m}^2\text{K)}$
Opaque door (less than 30% glazed area)	$U = 1.0 \text{ W/(m}^2\text{K)}$
Semi-glazed door (30–60% glazed area)	$U = 1.0 \text{ W/(m}^2\text{K)}$
Windows and glazed doors with greater than 60% glazed area	$U = 1.2 \text{ W/(m}^2\text{K)}$ Frame factor = 0.7
Roof windows	$U = 1.2 \text{ W/(m}^2\text{K)}$, when in vertical position (for correction due to angle, see specification in SAP 10 Appendix R)
Rooflights	$U = 1.7 \text{ W/(m}^2\text{K)}$, when in horizontal position (for correction due to angle, see specification in SAP 10 Appendix R)
Ventilation system	Natural ventilation with intermittent extract fans
Air permeability	$5 \text{ m}^3/(\text{h}\cdot\text{m}^2)$ at 50 Pa
Main heating fuel (space and water)	Mains gas
Heating system	Boiler and radiators Central heating pump 2013 or later, in heated space Design flow temperature = 55°C
Boiler	Efficiency, SEDBUK 2009 = 89.5%
Heating system controls	Boiler interlock, ErP Class V Either: – single storey dwelling in which the living area is greater than 70% of the total floor area: programmer and room thermostat – any other dwelling: time and temperature zone control, thermostatic radiator valves
Hot water system	Heated by boiler (regular or combi as above) Separate time control for space and water heating
Wastewater heat recovery (WWHR)	All showers connected to WWHR, including showers over baths Instantaneous WWHR with 36% recovery efficiency utilisation of 0.98
Hot water cylinder	If cylinder, declared loss factor = $0.85 \times (0.2 + 0.051 \text{ V}^{2/3}) \text{ kWh/day}$ where V is the volume of the cylinder in litres
Lighting	Fixed lighting capacity (lm) = $185 \times \text{total floor area}$ Efficacy of all fixed lighting = 80 lm/W
Air conditioning	None
Photovoltaic (PV) system	For houses: kWp = 40% of ground floor area, including unheated spaces / 6.5 For flats: kWp = 40% of dwelling floor area / (6.5 x number of storeys in block) System facing south-east or south-west
NOTE:	
1. For a dwelling connected to an existing district heat network, an alternative notional building is used. See paragraph 1.8 and SAP 10.	
2. See SAP 10 for details.	

The Standard Assessment Procedure (SAP) first creates the notional reference building, based upon the same shape and form as the proposed dwelling and applies the above characteristics as defined in SAP10.2.

For the project at the West Hoathly Brickworks, a sample of 5 houses has been selected to offer a representative selection to enable an accurate figure for emissions/m² which can be used to analyse overall development performance.

Once all of the baseline emission rates have been calculated in line with the above Government approved methodologies, they are considered as stage 'zero' of the energy hierarchy as described earlier and Target Emission Rate sets the benchmark for the worst performing, but legally permissible, development, as set out in Table 1 below.

Table 1 – Baseline energy consumption and CO2 emissions

Unit	Baseline Emission Rate (regulated energy use) Kg/sqm	Total Regulated Emissions Kg
Sample 1	11.02	867.94
Sample 2	12.77	1191.57
Sample 3	11.15	1297.19
Sample 4	9.93	1470.43
Sample 5	10.02	1608.01
Total		125,917

The SAP compliance outputs are attached at **Appendix A**, identifying the above noted TER figures.

4.0 Design for energy efficiency

The first step in the energy hierarchy requires that buildings be designed to use improved energy efficiency measures – Be Lean. This will reduce demand for heating, cooling, and lighting, and therefore reduce operational costs while also minimizing associated carbon dioxide emissions.

This section sets out the measures included within the design of the development, to reduce the demand for energy, both gas and electricity (not including energy from renewable sources). The table at the end of this section details the amount of energy used and CO₂ produced by the subject building after the energy efficiency measures have been included.

To achieve reductions in energy demand the following measures have been included within the design and specification of the building:

3.1 Orientation & Passive Design

The National Planning Policy Framework emphasises the need to take account of climate change over the longer term and plan new developments to avoid increased vulnerability to the range of impacts arising from climate change. The UK Climate Impacts Programme 2009 projections suggest that by the 2080's the UK is likely to experience summer temperatures that are up to 4.2°C higher than they are today.

Accordingly, designers are to ensure buildings are designed and constructed to be comfortable in higher temperatures, without resorting to energy intensive air conditioning.

The design team have considered the issues of solar heat gain in conjunction with protecting the dwelling from overheating with key points noted below:-

- The project will be designed to best practice thermal insulation levels as noted, full details of which are noted under 3.3 below. Not only does good insulation assist in reducing heat losses in the winter, it has a significant impact on preventing heat travelling through the build fabric during the summer.
- The project is based in a semi-rural location in a low rise streetscape layout, offering little by way of topographical shading. Given the scale of the new development, inevitably, the proposed dwelling are orientated in all directions alignment.
- The main living areas are generally orientated away toward the southern aspect where possible to enhance the opportunities for useful solar gain, but treated with large glazed areas; this approach ensures good levels of natural daylight and sunlight to the principle living areas, harvesting useful solar gain, while reducing the potential for overheating from any spaces with a direct southerly aspect.
- Significant use is made of open plan layouts to enable significant cross ventilation opportunities.

- To further reduce any overheating risk, glazing that will achieve a g value (solar transmittance) of 0.45 or better in order to assist in reducing overheating risk, while still enabling significant useful solar gain.
- The dwelling construction will be of brick/block to offer high thermal mass to absorb heat during the day and purge it overnight during the summer, or release it back into the dwelling during winter.
- The new dwellings have large opening areas of glazing to enhance purge ventilation, which as noted above, is combined with the ability to cross ventilate.
- With the above strategy in place, there is no expectation for the use mechanical ventilation

3.2 Heating system

For the “notional” energy efficient model, the primary heating system for the dwellings will consist of a high efficiency condensing gas boilers to provide the domestic heating and hot water;

- A Rated Boilers– (90+% SEDBUK efficiency)

To increase the efficiency in the use of the heating system, the following controls will be used in a ‘boiler interlock’ system to eliminate needless firing of the boiler.

- Time and temperature zone control
- Boiler controls fitted with weather/load compensator

3.3 Fabric heat loss

Fabric

Insulation measures will be utilised to ensure the calculated thermal conductivity U-values exceed the Building Regulations minima, with specific guidance taken from the design team: -

- New wall constructions will be of a full fill brick/block construction and will target a U-Value of 0.15W/m²k or better.
- New roof constructions are to achieve a U-Value of 0.10W/m²k for horizontal ceilings, and 0.12W/m²k for roofs insulated at the pitch.
- The newly laid floors will achieve a minimum u value of 0.12/0.13W/m²k subject to perimeter/area ratios

Glazing

New glazing for windows and doors will be triple glazed and have area weighted average U-Values of 1.1/m² K or better

Air Tightness

The new dwellings will be tested for air tightness with a target value of 4m³/hr/m² for the new residential units, in line with best practice for naturally ventilated dwellings.

Construction Details

Heat loss via non-repeating thermal bridging will be minimised by the use of Accredited Construction Details for these new build units. An overall ψ value <0.06 is targeted to ensure compliance with the minimum standards for dwelling fabric energy efficiency under AD Part L 2021.

3.4 Ventilation

The design team are proposing an air tight dwelling utilising natural ventilation, as set out above.

3.5 Lighting

The development will incorporate high efficiency light fittings utilising LED lamps.

The use of LED lighting will also minimise the internal gains commonly associated with tungsten and fluorescent lighting systems and thereby further reduce the potential for the flats to overheat.

External lighting will utilise daylight controls to ensure lights are not active during the day.

5.0 Supplying Energy Efficiently

The second stage in the energy hierarchy is to ensure efficient and low carbon energy supply – Be Clean. In particular, this concerns provision of decentralised energy and/or the use of CHP where practical and appropriate.

Given this rural location, it is understood that there are no current proposals for any district energy networks in the West Hoathly area, so this matter cannot be considered further.

However, we can consider an on-site provision:-

4.2 On-site CHP/District Heating

The heat production facility for a district heating scheme is generally considered to include heat only boilers (HOB) and/or the production of both electricity and heat i.e. CHP.

CHP is, as a rule of thumb, only operated as a base load as, depending on the technology, it may be difficult and/or inefficient to operate according to daily variations in demand. In a well-designed district heating network heat from CHP will provide between 60% and 80% of the annual baseline heat (heating and hot water) requirement with heat-only boiler plants providing the peak load and back-up. To maximise efficiency of the engine it needs to run for at least 17 hours a day; therefore, the heat load needs to be present for this period.

The key benefit from running a CHP engine is that it produces electricity, which can displace grid supplied electricity, which has significant carbon savings. It is for this reason that CHP is designed to run for as many hours of the year as possible.

Guidance states developments providing a substantial coincidence of demand for heat and power for the majority of hours in the year (5,000 hours per annum) and the heat to power ratio is low (e.g. 1:1), will offer good quality CHP.

Clearly, as a large scale residential development, there is limited potential for a CHP system to be justified, but due to the lack of a consistent base load, reducing to only domestic hot water demand in the morning and evening peaks during the summer period, combined with the clear risk of significant distribution losses associated with a large low rise development, would suggest that the use of a CHP lead localised district system would be inappropriate.

6.0 Renewable Energy Options

The final stage of the energy hierarchy requires development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible – Be Green.

Renewable energy can be defined as energy taken from naturally occurring or renewable sources, such as sunlight, wind, waves/tides, geothermal etc. Harnessing these energy sources can involve a direct use of natural energy, such as solar water heating panels, or it can be a more indirect process, such as the use of Biofuels produced from plants, which have harnessed and embodied the sun's energy through photosynthesis.

It should be noted that the cost of electricity is some 3.5 x that of gas and accordingly, emphasis will be placed upon "off-setting" grid based electricity in order to achieve the optimum use of renewable technologies.

This section then sets out the feasibility of implementing different energy technologies in consideration of: -

- Potential for Carbon savings
- Capital costs
- Running costs
- Payback period as a result of energy saved/Government incentives
- Maturity/availability of technology
- Reliability of the technology and need for back up or alternative systems.

5.1 Government incentives

5.1.1 Smart Export Guarantee (SEG)

Introduced in 2020, the SEG will enable solar photovoltaic (PV), wind, hydro and anaerobic digestion (AD) installations up to 5MW and micro-combined heat and power (micro-CHP) up to 50kW will be able to receive an export tariff under the policy.

The SEG is a market-led initiative, requiring electricity supply licensees to offer export tariffs to eligible generators. Suppliers are free to set their own SEG compliant tariff price (provided it is above zero pence at all times) and decide how their tariffs work.

Installation owners are able to shop around and select the Licensee of their choice based upon an offer of the most appropriate tariff.

Payment are made against metered exports only.

5.2 Wind turbines

Wind turbines come in two main types'- horizontal axis and vertical axis. The more traditional horizontally axis systems rotate around the central pivot to face into the wind, whilst vertical axis systems work with wind from all directions.

The potential application of wind energy technologies at a particular site is dependent upon a variety of factors. But mainly these are: -

- Wind speed
- Wind turbulence
- Visual impact
- Noise impact
- Impact upon ecology

The availability and consistency of wind in urban environments is largely dependent upon the proximity, scale and orientation of surrounding obstructions. The site is bordered by other properties approximately 2 to 3 storeys in height in all directions.

To overcome these obstructions and to receive practical amounts of non-turbulent wind, the blades of a wind turbine would need to be placed significantly above the roof level of the surrounding buildings and the new development itself.

It is clear that a wind turbine(s) of this size would be considered unacceptable in this location, proximate to the newly proposed dwellings and is therefore dismissed as an option.

5.3 Solar Energy

5.3.1 Solar water heating

Solar water heating panels come in two main types; flat plate collectors and evacuated tubes. Flat plate collectors feed water, or other types of fluid used specifically to carry heat, through a roof mounted collector and into a hot water storage tank. Evacuated tube collectors are slightly more advanced as they employ sealed vacuum tubes, which capture and harness the heat more effectively.

Solar energy can be delivered in 2 formats as noted above, each system requiring an appropriate area in which to install panels.

Solar hot water systems are of course, displacing gas or high efficiency heat pumps for domestic hot water provision (as noted above), and due to the low cost of these energies, solar thermal systems tend to have a very poor pay back model.

Accordingly, to optimise the roof space available and the strategy to off-set the electrical use, solar PV may be a stronger candidate (see below) and offer a greater return in terms of a return on investment.

5.3.2 Photovoltaics (PV)

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells will be accumulated on a PV panel, usually about 2.0m x 1.0m.

These panels are then wall, roof or floor mounted and are connected directly to the electricity grid via the properties meter. In this way, the electrical generation can be fully exported and is not related to the consumption of the apartments.

Despite the withdrawal of the Feed in Tariff, the returns on PV installations are still able to achieve 8-9% returns via the reduction in (ever more expensive) electricity consumption.

However, taking into account the visual impact of roof mounted PV, the design team are promoting an alternative source of renewable energy as selected below.

5.4 Biomass heating

Biomass is a term given to fuel derived directly from biological sources for example rapeseed oil, wood chip/pellets or gas from anaerobic digestion. It can only be considered as a renewable energy source if the carbon dioxide emitted from burning the fuel is later recaptured in reproducing the fuel source (i.e. trees that are grown to become wood fuel, capture carbon as they grow).

Biomass heating systems require space to site a boiler and fuel hopper along with a supply of fuel. There also needs to be a local source of biomass fuel that can be delivered on a regular basis.

It is not considered appropriate to specify biomass boilers within the proposed development, as they do not have space to accommodate a relatively large biomass boiler and a supply of fuel.

A boiler of this type would replace the need for a conventional gas boiler and therefore offset all the gas energy typically used for space and water heating, however, biomass releases high levels of NO_x emissions and would therefore have to be considered carefully against the standard of local air quality in the location.

The use of biomass is not considered appropriate.

5.5 Ground source heat pump

Ground source heating or cooling requires a source of consistent ground temperature, which could be a vertical borehole or a spread of pipework loops and a 'heat pump'. The system uses a loop of fluid to collect the more constant temperature in the ground and transport it to a heat pump. In a cooling system this principle works in reverse and the heat is distributed into the ground.

The heat pump then generates increased temperatures by 'condensing' the heat taken from the ground, producing hot water temperatures in the region of 45°C. This water can then be used as pre-heated water for a conventional boiler or to provide space heating with an under-floor heating system.

The use of a ground source heating/cooling system will therefore require:

- Vertical borehole or ground loop
- Use of under floor heating
- Space for heat pump unit

Clearly, there is insufficient land area to install low level collector devices and the use of deep bore solutions are very expensive and do not align with the development of low rise housing in a cost/benefit analysis. The use of ground source heating is not considered appropriate.

5.6 Air source heat pump (ASHP)

Air source heating or cooling also employs the principle of a heat pump. This time either, upgrading the ambient external air temperature to provide higher temperatures for water and space heating, or taking warmth from within the building and dissipating it to the outdoor air.

Becoming more common, and soon to be an everyday site on future housing developments, the external units have a limited visual impact, which can be further mitigated with ventilated/louvred enclosures.



It must be remembered that heat pumps utilise grid-based electricity, so calculations base the benefits on SAP10.2 emissions data

Assuming a seasonal system efficiency of 320% (Coefficient of Performance of 3.2) and that the air source heat pump will replace 100% of the space heating/hot water demand, then the system would reduce the overall CO₂ emissions by approximately 70%. The table below demonstrates, on the assumption of a demand of 10,000kWh/year for heating and hot water.

Table 2 – Air Source Heat Pump Performance

Type of Array	Energy Consumption (kWh/yr.)	Emission factor (kgCO ₂ /h)	Total CO ₂ emissions (kg/annum)
90% efficient gas boiler	11111	0.210	2333
320% efficient ASHP	2813	0.136	383
100% efficient immersion (back-up)	1000	0.136	136

A theoretical carbon saving of 77%

With the above data in mind, clearly an ASHP could be an option and the “be green” proposals include the use air source heat pumps for each house and flat.

Overall system efficiency has been advised at 340% + and this figure has been used within the final energy calculations.

This all electrical solution also has the distinct advantage and emitting zero local pollutants in the form of NO_x of particulate matter.

5.7 Final Emissions Calculation

Given the outcome of the feasibility study above, the developer is proposing the use the above noted air source heat pump system to deliver the heating and hot water demands to the development.

Accordingly, the final SAP (DER) outputs are attached at **Appendix A:-**

Table 3 – Final energy consumption and CO₂ reductions

Unit	Building Emission Rate (regulated energy use) Kg/sqm	Total Regulated emissions Kg
Sample 1	4.33	341.03
Sample 2	4.67	435.76
Sample 3	4.10	476.99
Sample 4	3.38	500.51
Sample 5	3.28	526.37
Total		44,626

The data at Table 3 confirms that overall regulated emissions have been reduced by **64.56%** over and above the baseline model though passive design measures and efficient services.

The project clearly aligns with the requirements of MSDC Policy DP39, achieving minimal CO2 emissions very passive design, energy efficient fabric and use of renewable technologies.

7.0 Sustainable Design & Construction

6.1 Sustainable Design and Construction

The project team seek to enhance to the sustainability credentials of the West Hoathly Brickworks project by following the principles set out in BRE's Environmental Assessment Model, with particular attention paid to the following issues:-

6.2 Energy efficiency; vacant & underused land and buildings

For matters of Passive Design, Solar gain control & daylighting, Ventilation, Thermal Performance, Services Strategy, Low or zero carbon technologies and overall Energy Performance, all these matters have been dealt within the Energy Statement; Sections 2 to 6 above.

6.3 Materials

The design team have put a strong focus on sustainability and durability when considering construction profiles and building materials for the development. High Green Guide ratings will be achieved wherever possible and materials will be assessed for suitability with regards to Whole Life Costs.

Insulating materials will be specified to maximise thermal performance whilst still paying attention to the environmental impact of the materials used. The re-use and use of recycled products will be pursued wherever feasible and the use of other low embodied energy products will be further investigated.

In line with the above strategy, all materials from the cut will be re-used in the fill, for the landscaping works, ensuring zero inert waste transported off-site.

Responsible sourcing will also be pursued. All timber used on site during the construction phase and within the building will be from FSC sources or equivalent. Other materials, including insulation, will be sourced from manufacturers who employ environmental management systems such as ISO 14001 or BES 6001. Where possible, materials will be sourced locally.

Non-toxic materials will be used wherever possible, including the specification of products with low VOC content in line with European testing standards.

A Site Waste Management Plan (SWMP) will be produced for the site, which will determine how to maximise the recovery of materials from the enabling works for subsequent high-grade/value applications.

6.4 Air pollution

Construction site impacts

The construction site will be managed in such a way that the environmental impact is minimised. This includes following best practice policies for dust pollution by using dust sheets, covering skips and damping down where appropriate.

The contractor will be enrolled on the Considerate Constructors Scheme and achieve a compliant score of at least 25.

A formal air quality assessment accompanies the formal application.

Plant and machinery

All plant and equipment installed in the dwellings will be appropriately sized and selected for efficiency in order to reduce greenhouse gas emissions. All equipment will be frequently maintained to ensure it continues to run efficiently and cleanly.

6.5 Noise pollution

There are existing dwelling to the west and south of the brickworks site, as such, the project will be developed in a sensitive manner as below:-

Construction site impacts

The construction site will be managed in such a way that the environmental impact is minimised. This includes following best practice policies to minimise noise pollution, including the use of quieter machinery where possible. Site working hours will be managed to mitigate the possibility that they will cause a nuisance to the surrounding properties.

Noise impact of the building

The development will comply with Building Regulations Part E, providing a good level of sound insulation between the proposed development and surrounding buildings. All new windows will be triple glazed to minimise the transmission of noise between the each dwelling and adjacent properties.

The external heat pump installations will have suitable acoustic enclosures to minimise and noise nuisance.

6.6 Contaminated land

A site investigation will be undertake to assess the potential for any contaminants with appropriate remediation put in place as required

6.7 Water quality, saving and drainage

Flood risk and surface water drainage

The proposed site layout increases impermeable areas. Accordingly, a formal strategy is to be developed to manage and reduce surface water run-off, the formal report accompanying the application under separate cover.

Water consumption

Internal potable water use will be limited to 110litres/person/day through the specification of low flow fittings and dual flush toilets. All white goods provided will have maximum water efficiency ratings.

The following specifications will be considered in order to meet the water consumption target:

- Basin Taps - 5 l/min
- WCs – 6/3 litre flush
- Kitchen taps – 7l/min
- Baths – 155l capacity
- Showers 9l/min

Construction site impacts

The construction site will be managed in such a way that the environmental impact is controlled and minimised. Best practice guidelines for preventing water pollution will be followed on site.

6.8 Light pollution

The development is in an semi-urbanised location, and therefore will not significantly contribute to increasing the effects of light pollution.

The design team will follow the appropriate ILE design guidance with a view to achieving compliance.

6.9 Waste and recycling

Site waste management

A construction site resource management plan will be developed and implemented to ensure that construction site waste is effectively reduced and recycled, including designing waste out from the initial stages. Material ordering control and modern construction methods will be employed to minimise the potential for waste on site.

Waste will either be segregated on site into at least 5 different streams for recycling or collected, sorted and recycled by an external recycling contractor. Re-use of construction waste will also be encouraged. The site waste management plan will also ensure that hazardous waste is properly managed.

Operational waste management

The recycling of operational waste once the dwellings are occupied will also be encouraged through the provision of recycling facilities and dedicated internal and external storage for recyclable materials.

6.10 Habitats and wildlife

A suitably qualified ecologist has been employed to assess the site as existing and to report on opportunities for a general enhancement of site ecology in conjunction with a long term strategy for maintenance.

8.0 Conclusions

The application for the redevelopment of the West Hoathly Brickworks has sought to deliver the highest of environmental standards over and above the requirements of the Mid-Sussex District Plan.

This report has detailed the baseline energy requirements for the proposed development, the reduction in energy demand as a result of energy efficiency measures and the potential to achieve further CO₂ reductions using renewable energy technologies.

The baseline results have shown that if the sample dwellings were built to a standard to meet only the minimum requirements of current building regulations, the total amount of CO₂ regulated emissions would be **125,917Kg/year**.

The design team also intend to introduce the passive energy efficiency measures into the development, as detailed in section 3.

There is also a requirement to reduce CO₂ regulated emissions across the development using renewable or low-carbon energy sources, where practical and feasible. Therefore, the report has considered the feasibility of the following technologies:

- Wind turbines
- Solar hot water
- Photovoltaic systems
- Biomass heating
- CHP (Combined heat and power)
- Ground & Air source heating

The results of the assessment of suitable technologies relative to the nature, locations and type of development suggest that air source heat pump technology should be used to supply the heating and domestic hot water to the new houses.

The SAP models (reproduced at **Appendix A**) for the sample which have also been detailed above in Table 3, show a final gross emission level of **44,626Kg/year** representing a total **64.56%** reduction in regulated emissions over the baseline model.

Accordingly, the proposed housing development aligns with the requirements of the MSDC Policy DP39: Sustainable Design and Construction

Appendix A

SAP 2021 – Compliance Outputs

DER/TER Emissions

Plot Reference

Sample 1

Issued on Date

12/01/2026

Assessment Reference

Sample 1

Plot Type Ref

Plot Address

SAP Version

10.2

SAP Rating

83 B

DER

4.33

TER

11.02

Environmental

96 A

% DER < TER

60.71

CO₂ Emissions (t/year)

0.3

DFEE

28.81

TFEE

33.56

Compliance Check

See BREL

% DFEE < TFEE

14.17

% DPER < TPER

20.83

DPER

45.50

TPER

57.47

Energy Saving Calculations Summary



Assessor Name

Mr. George Farr

Assessor ID

T355-0001

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 (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.3800 (1b)	x 2.5000 (2b)	= 98.4500 (1b) - (3b)
First floor	39.3800 (1c)	x 2.7000 (2c)	= 106.3260 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.7760 (5)

2. Ventilation rate

	m ³ 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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1953 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3953 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3953 (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	0.5041	0.4942	0.4843	0.4349	0.4250	0.3756	0.3756	0.3657	0.3953	0.4250	0.4448	0.4645 (22b)
Effective ac	0.6270	0.6221	0.6173	0.5946	0.5903	0.5705	0.5705	0.5669	0.5781	0.5903	0.5989	0.6079 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
G			12.1500	1.0536	12.8017		(27)
D			1.9900	1.1000	2.1890		(26a)
GF			39.3800	0.1200	4.7256	110.0000	4331.8000 (28a)
EW	47.8400	14.1400	33.7000	0.1500	5.0550	60.0000	2022.0000 (29a)
C	39.3800		39.3800	0.1000	3.9380	9.0000	354.4200 (30)
Total net area of external elements Aum(A, m ²)			126.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7093		(33)
Main dwelling							
PW			89.0200	0.0000	0.0000	45.0000	4005.9000 (32)
IW			125.0100			75.0000	9375.7500 (32c)
IF			39.3800			18.0000	708.8400 (32d)
IC			39.3800			9.0000	354.4200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21153.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							268.5771 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				8.1600	0.0540	0.4406	
E3 Sill				8.1600	0.0400	0.3264	

E4 Jamb									19.3500	0.0490	0.9482	
E5 Ground floor (normal)									26.3200	0.0380	1.0002	
E6 Intermediate floor within a dwelling									26.3200	0.0120	0.3158	
E10 Eaves (insulation at ceiling level)									9.2000	0.0420	0.3864	
E18 Party wall between dwellings									20.8000	0.0790	1.6432	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.0608 (36)
Point Thermal bridges											(36a) =	0.0000
Total fabric heat loss											(33) + (36) + (36a) =	33.7701 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.3725	42.0392	41.7124	40.1777	39.8906	38.5539	38.5539	38.3064	39.0688	39.8906	40.4715	41.0788 (38)
Heat transfer coeff	76.1426	75.8093	75.4826	73.9478	73.6607	72.3240	72.3240	72.0765	72.8389	73.6607	74.2416	74.8489 (39)
Average = Sum(39)m / 12 =												73.9465
Table 5a Calculation Summary												
HLP (average)			Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.9389 (40)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.4389 (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												
	75.0775	73.9625	72.3923	69.4972	67.3294	64.9256	63.6272	65.1864	66.8841	69.4562	72.4109	74.8236 (42b)
Hot water usage for other uses												
	39.6069	38.1666	36.7264	35.2861	33.8459	32.4056	32.4056	33.8459	35.2861	36.7264	38.1666	39.6069 (42c)
Average daily hot water use (litres/day)												105.6149 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	114.6844	112.1291	109.1187	104.7833	101.1753	97.3313	96.0329	99.0323	102.1702	106.1826	110.5775	114.4305 (44)
Energy content (annual)												
	181.6320	159.6703	167.7114	143.4432	136.2014	119.6801	116.1434	122.6227	125.9861	144.0887	157.5380	179.1706 (45)
Distribution loss (46)m = 0.15 x (45)m												
	27.2448	23.9506	25.1567	21.5165	20.4302	17.9520	17.4215	18.3934	18.8979	21.6133	23.6307	26.8756 (46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7614 (55)
Total storage loss												
	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034 (56)
If cylinder contains dedicated solar storage												
	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034 (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												
	228.4978	202.0007	214.5772	188.7972	183.0672	165.0341	163.0092	169.4885	171.3401	190.9545	202.8920	226.0364 (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												
	228.4978	202.0007	214.5772	188.7972	183.0672	165.0341	163.0092	169.4885	171.3401	190.9545	202.8920	226.0364 (64)
Total per year (kWh/year)												2305.6949 (64)
Electric shower(s)												2306 (64)
	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												
	97.8853	86.9547	93.2567	83.9780	82.7796	76.0768	76.1103	78.2647	78.1736	85.4021	88.6646	97.0669 (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	121.9456	121.9456	121.9456	121.9456	121.9456	121.9456	121.9456	121.9456	121.9456	121.9456	121.9456	121.9456	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.2700	130.9418	118.2700	122.2124	118.2700	122.2124	118.2700	118.2700	122.2124	118.2700	122.2124	118.2700	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.8294	219.0794	213.4095	201.3388	186.1018	171.7811	162.2140	159.9640	165.6340	177.7046	192.9417	207.2623	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1946	35.1946	35.1946	35.1946	35.1946	35.1946	35.1946	35.1946	35.1946	35.1946	35.1946	35.1946	(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)	-97.5565	-97.5565	-97.5565	-97.5565	-97.5565	-97.5565	-97.5565	-97.5565	-97.5565	-97.5565	-97.5565	-97.5565	(71)
Water heating gains (Table 5)	131.5662	129.3969	125.3450	116.6362	111.2629	105.6623	102.2988	105.1945	108.5744	114.7878	123.1452	130.4662	(72)
Total internal gains	526.2494	539.0019	516.6082	499.7711	475.2184	459.2395	442.3666	443.0122	456.0044	470.3462	497.8830	515.5823	(73)

6. Solar gains												
[Jan]				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
East				3.2400		19.6403		0.5700		0.7000	0.7700	17.5954 (76)
West				8.9100		19.6403		0.5700		0.7000	0.7700	48.3873 (80)
Solar gains	65.9826	129.0761	212.5699	310.0205	379.9417	388.9380	370.2848	318.0692	247.2276	153.1596	82.2726	54.2609 (83)
Total gains	592.2320	668.0779	729.1781	809.7916	855.1601	848.1774	812.6514	761.0814	703.2320	623.5058	580.1556	569.8432 (84)

Full SAP Calculation Printout

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9835	0.9605	0.8777	0.7130	0.4929	0.3394	0.3800	0.6369	0.9123	0.9820	0.9941	(94)
Useful gains	588.3398	657.0741	700.3472	710.7575	609.7035	418.0932	275.8311	289.2350	447.8735	568.8121	569.7080	566.4629	(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	1202.7418	1128.5393	1018.1288	838.8747	638.7074	420.4555	276.0097	289.5929	458.8073	709.2806	951.2177	1165.8184	(97)
Space heating kWh	457.1151	316.8247	236.4295	92.2444	21.5789	0.0000	0.0000	0.0000	0.0000	104.5086	274.6870	445.9205	(98a)
Space heating requirement - total per year (kWh/year)												1949.3086	
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	457.1151	316.8247	236.4295	92.2444	21.5789	0.0000	0.0000	0.0000	0.0000	104.5086	274.6870	445.9205	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1949.3086	
Space heating per m2												24.7500	(99)
										(98c) / (4) =			

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

[illegible]

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	2321.8568 (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	828.7172	0.1569	130.0020 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1301.9861	0.1409	183.4051 (264)
Space and water heating			313.4071 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	191.1535	0.1443	27.5894 (268)
Total CO2, kg/year			340.9965 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3300 (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	828.7172	1.5807	1309.9834 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1301.9861	1.5209	1980.1493 (278)
Space and water heating			3290.1327 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	191.1535	1.5338	293.1976 (282)
Total Primary energy kWh/year			3583.3303 (286)
Dwelling Primary energy Rate (DPER)			45.5000 (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	39.3800 (1b)	x 2.5000 (2b)	= 98.4500 (1b) - (3b)
First floor	39.3800 (1c)	x 2.7000 (2c)	= 106.3260 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.7760 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1465 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3965 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3965 (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	0.5055	0.4956	0.4857	0.4362	0.4262	0.3767	0.3767	0.3668	0.3965	0.4262	0.4461	0.4659 (22b)
Effective ac	0.6278	0.6228	0.6180	0.5951	0.5908	0.5709	0.5709	0.5673	0.5786	0.5908	0.5995	0.6085 (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 Semi-glazed door			1.9900	1.0000	1.9900		(26a)

[illegible]

Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2853.0160 (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)	192.7433 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1946.4552 (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 saved or generated	0.0000 (237)
total delivered energy for all uses	3474.5012 (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	2289.1970	0.2100	480.7314 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2853.0160	0.2100	599.1334 (264)
Space and water heating			1079.8647 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	192.7433	0.1443	27.8188 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-782.9353	0.1346	-105.3887
PV Unit electricity exported	-1163.5199	0.1259	-146.4894
Total			-251.8781 (269)
Total CO2, kg/year			867.7347 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0200 (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	2289.1970	1.1300	2586.7927 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2853.0160	1.1300	3223.9081 (278)
Space and water heating			5810.7008 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	192.7433	1.5338	295.6361 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-782.9353	1.4975	-1172.4351
PV Unit electricity exported	-1163.5199	0.4621	-537.7171
Total			-1710.1521 (283)
Total Primary energy kWh/year			4526.2855 (286)
Target Primary Energy Rate (TPER)			57.4700 (287)

Plot Reference	Sample 2			Issued on Date	12/01/2026
Assessment Reference	Sample 2	Plot Type Ref			
Plot Address				SAP Version	10.2
SAP Rating					
	80 C	DER	4.67	TER	12.77
Environmental	96 A	% DER < TER			63.43
CO₂ Emissions (t/year)	0.39	DFEE	37.70	TFEE	44.95
Compliance Check	See BREL	% DFEE < TFEE			16.13
% DPER < TPER	27.04	DPER	48.84	TPER	66.94
 Calculation Summary					
Client	Mr. George Farr			Assessor ID	T355-0001

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.6700 (1b)	x 2.5000 (2b)	= 116.6750 (1b) - (3b)
First floor	46.6400 (1c)	x 2.7000 (2c)	= 125.9280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.6030 (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	4 * 10 =	40.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000	
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50		4.0000 (17)	
Infiltration rate		0.3649 (18)	
Number of sides sheltered		0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3649 (21)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	Net Area m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
G			13.2700	1.0536	13.9818		(27)
D			1.9900	1.1000	2.1890		(26a)
GF			46.6700	0.1200	5.6004	110.0000	5133.7000 (28a)
EW	152.2600	15.2600	137.0000	0.1500	20.5500	60.0000	8220.0000 (29a)
C	46.6700		46.6700	0.1000	4.6670	9.0000	420.0300 (30)
Total net area of external elements Aum(A, m ²)			245.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.9882		(33)
Main dwelling							
IW			177.0600			75.0000	13279.5000 (32c)
IF			46.6700			18.0000	840.0600 (32d)
IC			46.6700			9.0000	420.0300 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		28313.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							303.4329 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				8.5200	0.0540	0.4601	
E3 Sill				8.5200	0.0400	0.3408	
E4 Jamb				21.0200	0.0490	1.0300	

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.7669 (37)

[illegible]

Ծախսերի Բաժանում		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0873	1.0837	1.0802	1.0636	1.0605	1.0460	1.0434	1.0516	1.0605	1.0668	1.0733 (40)
HLP (average)											1.0636
Days in mont	31	28	31	30	31	30	31	30	31	30	31

Assumed occupancy	2.6684 (42)
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[illegible][illegible]

	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034 (56)
If cylinder contains dedicated solar storage	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034 (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												
	239.2741	211.4740	224.5275	197.3077	191.1480	172.1348	169.9001	176.7637	178.8149	199.5034	212.2387	236.6666 (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	239.2741	211.4740	224.5275	197.3077	191.1480	172.1348	169.9001	176.7637	178.8149	199.5034	212.2387	236.6666 (64)

12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =										2409.7534 (64)
Electric shower(s)											2410 (64)
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											
101.4684	90.1046	96.5652	86.8078	85.4665	78.4378	78.4015	80.6837	80.6589	88.2446	91.7724	100.6014 (65)

Metabolic gains (Table 5), Watts

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	133.4185	133.4185	133.4185	133.4185	133.4185	133.4185	133.4185	133.4185	133.4185	133.4185	133.4185	133.4185 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.0841	150.6645	136.0841	140.6202	136.0841	140.6202	136.0841	136.0841	140.6202	136.0841	140.6202	136.0841 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.0372	247.5799	241.1724	227.5314	210.3121	194.1285	183.3168	180.7741	187.1816	200.8226	218.0419	234.2255 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3419	36.3419	36.3419	36.3419	36.3419	36.3419	36.3419	36.3419	36.3419	36.3419	36.3419	36.3419 (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)	-106.7348	-106.7348	-106.7348	-106.7348	-106.7348	-106.7348	-106.7348	-106.7348	-106.7348	-106.7348	-106.7348	-106.7348 (71)
Water heating gains (Table 5)	136.3822	134.0842	129.7919	120.5664	114.8743	108.9414	105.3784	108.4458	112.0263	118.6084	127.4616	135.2169 (72)
Total internal gains	580.5291	595.3542	570.0739	551.7436	524.2961	506.7157	487.8048	488.3295	502.8537	518.5406	549.1493	568.5521 (73)

[Jan					Area	Solar flux	g		FF			Access	Gains
					m2	Table 6a	Specific data		Specific data			factor	W
						W/m2	or Table 6b		or Table 6c			Table 6d	
East					4.6600	19.6403	0.5700		0.7000			0.7700	25.3069 (76)
West					8.6100	19.6403	0.5700		0.7000			0.7700	46.7581 (80)
Solar gains	72.0650	140.9744	232.1648	338.5985	414.9652	424.7907	404.4181	347.3891	270.0173	167.2780	89.8566	59.2627 (83)	
Total gains	652.5941	736.3286	802.2387	890.3421	939.2613	931.5064	892.2229	835.7187	772.8710	685.8186	639.0058	627.8149 (84)	

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	77.5164	77.7743	78.0287	79.2465	79.4785	80.5770	80.5770	80.7837	80.1503	79.4785	79.0104	78.5270
alpha	6.1678	6.1850	6.2019	6.2831	6.2986	6.3718	6.3718	6.3856	6.3434	6.2986	6.2674	6.2351
util living area	0.9983	0.9959	0.9889	0.9555	0.8540	0.6523	0.4790	0.5312	0.8006	0.9727	0.9957	0.9987 (86)
Living	20.1734	20.2834	20.4520	20.6890	20.8624	20.9385	20.9497	20.9484	20.9074	20.6801	20.3924	20.1627
Non living	19.0459	19.1887	19.4050	19.7078	19.9006	19.9763	19.9822	19.9841	19.9514	19.7044	19.3398	19.0416
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 2	19.6263	19.1887	19.4050	19.7078	19.9006	19.9763	19.9822	19.9841	19.9514	19.7044	19.3398	19.2184 (90)
Living area fraction	0.9976	0.9943	0.9843	0.9368	0.8010	0.5636	0.3764	0.4239	0.7188	0.9575	0.9937	0.9981 (89)
MIT	19.9835	19.5999	19.7983	20.0764	20.2619	20.3378	20.3456	20.3463	20.3105	20.0709	19.7352	19.6171 (92)
Temperature adjustment									fLA = Living area / 4 =			0.0000
adjusted MIT	19.9835	19.5999	19.7983	20.0764	20.2619	20.3378	20.3456	20.3463	20.3105	20.0709	19.7352	19.6171 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9934	0.9829	0.9379	0.8147	0.5916	0.4089	0.4580	0.7437	0.9582	0.9929	0.9978 (94)
Useful gains	651.0142	731.4773	788.5516	835.0288	765.2559	551.1003	364.8592	382.7430	574.8187	657.1511	634.4614	626.4507 (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	1591.2461	1486.5094	1340.3879	1109.1996	847.2422	560.0401	365.5932	384.1999	609.4096	937.1947	1257.7223	1544.0899 (97)
Space heating kWh	699.5326	507.3816	410.5662	197.4030	60.9978	0.0000	0.0000	0.0000	0.0000	208.3524	448.7479	682.7236 (98a)
Space heating requirement - total per year (kWh/year)												3215.7051
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	699.5326	507.3816	410.5662	197.4030	60.9978	0.0000	0.0000	0.0000	0.0000	208.3524	448.7479	682.7236 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3215.7051
Space heating per m2										(98c) / (4) =		34.4626 (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 %)

237.0031 (206)

Efficiency of main space heating system 2 (in %)

0.0000 (207)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

[illegible]

Electricity for pumps and fans:

Total electricity for the above, kWh/year

0.0000 (231)

Electricity for lighting (calculated in Appendix L)

214.8959 (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	2943.9394 (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	1356.8200	0.1560	211.6777 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1372.2234	0.1409	193.3393 (264)
Space and water heating			405.0170 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	214.8959	0.1443	31.0161 (268)
Total CO2, kg/year			436.0331 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6700 (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	1356.8200	1.5776	2140.4821 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1372.2234	1.5210	2087.1215 (278)
Space and water heating			4227.6035 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	214.8959	1.5338	329.6145 (282)
Total Primary energy kWh/year			4557.2180 (286)
Dwelling Primary energy Rate (DPER)			48.8400 (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	46.6700 (1b)	x 2.5000 (2b)	= 116.6750 (1b) - (3b)
First floor	46.6400 (1c)	x 2.7000 (2c)	= 125.9280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	242.6030 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3737 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3737 (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	0.4764	0.4671	0.4577	0.4110	0.4017	0.3550	0.3550	0.3456	0.3737	0.4017	0.4204	0.4390 (22b)
Effective ac	0.6135	0.6091	0.6048	0.5845	0.5807	0.5630	0.5630	0.5597	0.5698	0.5807	0.5884	0.5964 (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							

6. Solar gains

[illegible]

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	2950.3335	(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)	221.5901	(232)
Energy saving/generation technologies (Appendices M, N and Q)		
PV generation	-2306.7817	(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 used	-0.0000	(236)
Energy saved	0.0000	(237)
Total delivered energy for all uses	4884.9533	(238)

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



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	3933.8114	0.2100	826.1004 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2950.3335	0.2100	619.5700 (264)
Space and water heating			1445.6704 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	221.5901	0.1443	31.9823 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-904.0703	0.1347	-121.7948
PV Unit electricity exported	-1402.7114	0.1259	-176.6610
Total			-298.4558 (269)
Total CO2, kg/year			1191.1262 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7700 (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	3933.8114	1.1300	4445.2069 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2950.3335	1.1300	3333.8769 (278)
Space and water heating			7779.0838 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	221.5901	1.5338	339.8823 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-904.0703	1.4979	-1354.2099
PV Unit electricity exported	-1402.7114	0.4623	-648.4701
Total			-2002.6800 (283)
Total Primary energy kWh/year			6246.3868 (286)
Target Primary Energy Rate (TPER)			66.9400 (287)

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							
G			14.6600	1.0536	15.4464		(27)
D			2.7800	1.1000	3.0580		(26a)
RL			1.0400	1.0536	1.0958		(27a)
GF			43.3200	0.1200	5.1984	110.0000	(28a)
EW	114.7200	17.4400	97.2800	0.1500	14.5920	60.0000	4765.2000 (29a)
SW	9.4100		9.4100	0.1300	1.2233	9.0000	84.6900 (29a)
DW	10.4200		10.4200	0.1500	1.5630	9.0000	93.7800 (29a)
SC	13.6200		13.6200	0.0917	1.2495	9.0000	122.5800 (30)
C	11.5100		11.5100	0.1000	1.1510	9.0000	103.5900 (30)
PR	22.2000	1.0400	21.1600	0.1200	2.5392	9.0000	190.4400 (30)
Total net area of external elements Aum(A, m2)			225.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.1166		(33)
Main dwelling							
PW			64.9100	0.0000	0.0000	45.0000	2920.9500 (32)
IW			156.1100			75.0000	11708.2500 (32c)
IF			73.0200			18.0000	1314.3600 (32d)
IC			73.0200			9.0000	657.1800 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6200	0.0540	0.5735
E3 Sill	10.6200	0.0400	0.4248
E4 Jamb	21.7700	0.0490	1.0667
E5 Ground floor (normal)	28.1000	0.0380	1.0678
E6 Intermediate floor within a dwelling	52.4300	0.0120	0.6292
E10 Eaves (insulation at ceiling level)	18.2800	0.0420	0.7678
E18 Party wall between dwellings	13.1800	0.0790	1.0412
E11 Eaves (insulation at rafter level)	8.2400	0.0310	0.2554
E12 Gable (insulation at ceiling level)	5.1600	0.0870	0.4489
E13 Gable (insulation at rafter level)	10.5400	0.0910	0.9591
E16 Corner (normal)	17.7800	0.0400	0.7112
E17 Corner (inverted - internal area greater than external area)	2.1900	-0.0630	-0.1380

calculated using Appendix K)
Total fabric heat loss
(33) + (36) + (36a) = 54.9243 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	62.4155	61.9156	61.4255	59.1238	58.6931	56.6884	56.6884	56.3171	57.4606	58.6931	59.5643	60.4751	(38)
Average = Sum(39)m / 12 =	117.3398	116.8399	116.3498	114.0481	113.6174	111.6127	111.6127	111.2414	112.3849	113.6174	114.4886	115.3994	(39)
	117.3398	116.8399	116.3498	114.0481	113.6174	111.6127	111.6127	111.2414	112.3849	113.6174	114.4886	115.3994	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0086	1.0043	1.0001	0.9803	0.9766	0.9594	0.9594	0.9562	0.9660	0.9766	0.9841	0.9919	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.8480 (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	83.0187	81.7858	80.0495	76.8482	74.4511	71.7931	70.3573	72.0814	73.9587	76.8028	80.0701	82.7380	(42b)
Hot water usage for other uses	43.7963	42.2037	40.6111	39.0185	37.4259	35.8333	35.8333	37.4259	39.0185	40.6111	42.2037	43.7963	(42c)
Average daily hot water use (litres/day)													116.7862 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	126.8150	123.9894	120.6606	115.8667	111.8770	107.6264	106.1906	109.5073	112.9772	117.4139	122.2738	126.5343	(44)
Energy content (annual)	200.8439	176.5593	185.4508	158.6157	150.6079	132.3392	128.4284	135.5930	139.3121	159.3296	174.2014	198.1222	(45)
Distribution loss (46)m = 0.15 x (45)m	30.1266	26.4839	27.8176	23.7924	22.5912	19.8509	19.2643	20.3389	20.8968	23.8994	26.1302	29.7183	(46)
Water storage loss (or HIU loss):													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	251.0577	221.9137	235.6646	207.2097	200.8217	180.9332	178.6422	185.8068	187.9061	209.5434	222.7954	248.3360	(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	251.0577	221.9137	235.6646	207.2097	200.8217	180.9332	178.6422	185.8068	187.9061	209.5434	222.7954	248.3360	(64)
12Total per year (kWh/year)													2530.6305 (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)
Heat gains from water heating, kWh/month	106.9516	94.9895	101.8334	91.6149	90.2482	82.8780	82.8735	85.2557	85.1965	93.1481	96.7972	106.0467	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.3995	142.3995	142.3995	142.3995	142.3995	142.3995	142.3995	142.3995	142.3995	142.3995	142.3995	142.3995	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.0563	173.8838	157.0563	162.2915	157.0563	162.2915	157.0563	157.0563	162.2915	157.0563	162.2915	157.0563	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	280.3688	283.2781	275.9467	260.3388	240.6367	222.1196	209.7489	206.8396	214.1711	229.7789	249.4810	267.9982	(68)
Pumps, fans	37.2400	37.2400	37.2400	37.2400	37.2400	37.2400	37.2400	37.2400	37.2400	37.2400	37.2400	37.2400	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-113.9196	-113.9196	-113.9196	-113.9196	-113.9196	-113.9196	-113.9196	-113.9196	-113.9196	-113.9196	-113.9196	-113.9196	(71)
Total internal gains	143.7522	141.3534	136.8729	127.2429	121.3013	115.1083	111.3891	114.5910	118.3284	125.1991	134.4405	142.5358	(72)
	646.8972	664.2352	635.5958	615.5932	584.7142	565.2393	543.9142	544.2068	560.5109	577.7542	611.9329	633.3102	(73)

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

Annual totals kWh/year		
Space heating fuel - main system 1	1509.8115	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	174.6401	
Water heating fuel used	1449.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	261.1575	(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)
HP (Appendix N)	0.0000	(235)
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3220.0233	(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	1509.8115	0.1560	235.5939 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1449.0543	0.1409	204.1453 (264)
Space and water heating			439.7392 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	261.1575	0.1443	37.6931 (268)
Total CO2, kg/year			477.4323 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1000 (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	1509.8115	1.5777	2381.9995 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1449.0543	1.5209	2203.9082 (278)
Space and water heating			4585.9077 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	261.1575	1.5338	400.5720 (282)
Total Primary energy kWh/year			4986.4798 (286)
Dwelling Primary energy Rate (DPER)			42.8600 (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	43.3200 (1b)	x 2.5000 (2b)	= 108.3000 (1b) - (3b)
First floor	43.3200 (1c)	x 2.9500 (2c)	= 127.7940 (1c) - (3c)
Second floor	29.7000 (1d)	x 2.1600 (2d)	= 64.1520 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	300.2460 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1332 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3832 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3832 (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	0.4886	0.4790	0.4694	0.4215	0.4120	0.3641	0.3641	0.3545	0.3832	0.4120	0.4311	0.4503 (22b)
Effective ac	0.6194	0.6147	0.6102	0.5889	0.5849	0.5663	0.5663	0.5628	0.5734	0.5849	0.5929	0.6014 (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 Semi-glazed door			2.7800	1.0000	2.7800		(26a)
TER Opening Type			14.6600	1.1450	16.7863		(27)
TER Roof Light			1.0400	1.5918	2.0148		(27a)
GF			43.3200	0.1300	5.6316		(28a)
EW	114.7200	17.4400	97.2800	0.1800	17.5104		(29a)
DW	9.4100		9.4100	0.1800	1.6938		(29a)
SC	10.4200		10.4200	0.1800	1.8756		(29a)
C	13.6200		13.6200	0.1100	1.4982		(30)
PR	11.5100		11.5100	0.1100	1.2661		(30)
PR	22.2000	1.0400	21.1600	0.1100	2.3276		(30)
Total net area of external elements Aum(A, m2)			225.2000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.3843		(33)
Main dwelling							
PW			64.9100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							238.9360 (35)

List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E10 Eaves (insulation at ceiling level)												
E18 Party wall between dwellings												
E11 Eaves (insulation at rafter level)												
E12 Gable (insulation at ceiling level)												
E13 Gable (insulation at rafter level)												
E16 Corner (normal)												
E17 Corner (inverted - internal area greater than external area)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
Point Thermal bridges												
Total fabric heat loss												

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	61.3679	60.9087	60.4585	58.3440	57.9484	56.1068	56.1068	55.7657	56.8162	57.9484	58.7487	59.5854 (38)
Average = Sum(39)m / 12 =												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0845	1.0806	1.0767	1.0585	1.0551	1.0393	1.0393	1.0364	1.0454	1.0551	1.0620	1.0692 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8480 (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	0.0000 (42a)
Hot water usage for baths	83.0187	81.7858	80.0495	76.8482	74.4511	71.7931	70.3573	72.0814	73.9587	76.8028	80.0701	82.7380	(42b)
Hot water usage for other uses	43.7963	42.2037	40.6111	39.0185	37.4259	35.8333	35.8333	37.4259	39.0185	40.6111	42.2037	43.7963	(42c)
Average daily hot water use (litres/day)													116.7862 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.8150	123.9894	120.6606	115.8667	111.8770	107.6264	106.1906	109.5073	112.9772	117.4139	122.2738	126.5343	(44)
Energy content (annual)	200.8439	176.5593	185.4508	158.6157	150.6079	132.3392	128.4284	135.5930	139.3121	159.3296	174.2014	198.1222	(45)
Distribution loss (46)m = 0.15 x (45)m	30.1266	26.4839	27.8176	23.7924	22.5912	19.8509	19.2643	20.3389	20.8968	23.8994	26.1302	29.7183	(46)
Water storage loss (or HIU loss):													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.1127 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1409 (55)
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(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	259.4727	229.5144	244.0797	215.3533	209.2367	189.0767	187.0572	194.2218	196.0497	217.9584	230.9389	256.7510	(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	259.4727	229.5144	244.0797	215.3533	209.2367	189.0767	187.0572	194.2218	196.0497	217.9584	230.9389	256.7510	(64)
12Total per year (kWh/year)													
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)
													0.0000 (64a)
Heat gains from water heating, kWh/month	113.6837	101.0700	108.5655	98.1298	96.9802	89.3928	89.6055	91.9877	91.7113	99.8801	103.3120	112.7787	(65)

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

[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					8.9100	36.7938		0.6300	0.7000	0.7700		100.1900 (77)
Northwest					5.7500	11.2829		0.6300	0.7000	0.7700		19.8272 (81)
Southeast					1.0400	38.2331		0.6300	0.7000	1.0000		15.7817 (82)
Solar gains	135.7990	240.6361	352.6688	474.0463	563.2297	572.9242	546.6618	478.3012	394.5620	272.3978	164.3855	115.0788 (83)
Total gains	790.1723	911.8575	995.7406	1096.9632	1155.4201	1142.4872	1095.0521	1026.9841	959.3966	857.6281	783.6421	755.8651 (84)

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	61.1992	61.4228	61.6435	62.7020	62.9040	63.8621	63.8621	64.0428	63.4897	62.9040	62.4966	62.0762
alpha	5.0799	5.0949	5.1096	5.1801	5.1936	5.2575	5.2575	5.2695	5.2326	5.1936	5.1664	5.1384
util living area	0.9957	0.9905	0.9785	0.9364	0.8335	0.6464	0.4802	0.5302	0.7786	0.9546	0.9905	0.9966 (86)
MIT	19.7236	19.9156	20.1848	20.5503	20.8264	20.9656	20.9939	20.9901	20.9102	20.5547	20.0862	19.7041 (87)
Th 2	20.0135	20.0167	20.0199	20.0349	20.0377	20.0507	20.0507	20.0531	20.0457	20.0377	20.0320	20.0261 (88)
util rest of house	0.9944	0.9875	0.9716	0.9159	0.7838	0.5629	0.3795	0.4260	0.7027	0.9355	0.9870	0.9955 (89)
MIT 2	18.5287	18.7754	19.1178	19.5778	19.8906	20.0307	20.0487	20.0495	19.9845	19.5933	19.0050	18.5130 (90)
Living area fraction	18.8763	19.1071	19.4282	19.8607	20.1628	20.3027	20.3236	20.3231	fLA = Living area / (4) =	20.2537	19.8730	19.3194
MIT	18.8763	19.1071	19.4282	19.8607	20.1628	20.3027	20.3236	20.3231	20.2537	19.8730	19.3194	18.8594 (91)
Temperature adjustment												0.0000
adjusted MIT	18.8763	19.1071	19.4282	19.8607	20.1628	20.3027	20.3236	20.3231	20.2537	19.8730	19.3194	18.8594 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9921	0.9838	0.9662	0.9115	0.7909	0.5860	0.4089	0.4564	0.7207	0.9315	0.9835	0.9936 (94)
Useful gains	783.9684	897.0857	962.0594	999.8356	913.7958	669.4411	447.7405	468.6810	691.4162	798.8446	770.6833	751.0491 (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	1839.1149	1786.0059	1619.4131	1349.7882	1038.8251	689.5128	450.2277	473.0056	748.4178	1138.2777	1509.7447	1823.4790 (97)
Space heating kWh	785.0289	597.3544	489.0712	251.9659	93.0218	0.0000	0.0000	0.0000	0.0000	252.5382	532.1242	797.8879 (98a)
Space heating requirement - total per year (kWh/year)												3798.9925
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	785.0289	597.3544	489.0712	251.9659	93.0218	0.0000	0.0000	0.0000	0.0000	252.5382	532.1242	797.8879 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3798.9925
Space heating per m2											(98c) / (4) =	32.6542 (99)

[illegible]

	300.3856	266.5533	285.1849	255.1192	254.0230	236.9383	234.4075	243.3857	245.6763	258.2725	268.9433	297.0726	(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	7.0685	7.3041	7.0685	7.3041	7.3041	(231)
Lighting	31.6832	25.4174	22.8856	16.7669	12.9513	10.5813	11.8146	15.3570	19.9473	26.1719	29.5611	32.5637	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.7672	-59.5260	-86.4574	-98.2171	-106.7056	-99.8209	-98.5422	-92.6260	-82.3358	-68.4883	-46.1289	-36.0315	(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	-21.6618	-45.7869	-91.4315	-137.9648	-183.0768	-184.2427	-182.1232	-153.9419	-112.4562	-65.7464	-29.0034	-17.1169	(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												4115.9182	(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												3145.9620	(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)												255.7014	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2141.1995	(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												5462.3820	(238)

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

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	4115.9182	0.2100	864.3428 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3145.9620	0.2100	660.6520 (264)
Space and water heating			1524.9948 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	255.7014	0.1443	36.9056 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-916.6470	0.1344	-123.1792
PV Unit electricity exported	-1224.5525	0.1258	-153.9897
Total			-277.1689 (269)
Total CO2, kg/year			1296.6608 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1500 (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	4115.9182	1.1300	4650.9876 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3145.9620	1.1300	3554.9370 (278)
Space and water heating			8205.9246 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	255.7014	1.5338	392.2033 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-916.6470	1.4966	-1371.8860
PV Unit electricity exported	-1224.5525	0.4616	-565.2390
Total			-1937.1250 (283)
Total Primary energy kWh/year			6791.1037 (286)
Target Primary Energy Rate (TPER)			58.3700 (287)

Plot Reference	Sample 4		Issued on Date	12/01/2026	
Assessment Reference	Sample 4	Plot Type Ref			
Plot Address			SAP Version	10.2	

SAP Rating	84 B	DER	3.38	TER	9.93
Environmental	97 A	% DER < TER		65.96	
CO ₂ Emissions (t/year)	0.43	DFEE	37.99	TFEE	43.50
Compliance Check	See BREL	% DFEE < TFEE		12.67	
% DPER < TPER	33.27	DPER	34.80	TPER	52.15

Client	Mr. George Farr	Assessor ID	T355-0001
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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	80.8400 (1b)	x 2.6000 (2b)	= 210.1840 (1b) - (3b)
First floor	67.2400 (1c)	x 2.7000 (2c)	= 181.5480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	148.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	391.7320 (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	6 * 10 = 60.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	Air changes per hour 60.0000 / (5) = 0.1532 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3532 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3532 (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	0.4503	0.4415	0.4326	0.3885	0.3797	0.3355	0.3355	0.3267	0.3532	0.3797	0.3973	0.4150 (22b)
Effective ac	0.6014	0.5974	0.5936	0.5755	0.5721	0.5563	0.5563	0.5534	0.5624	0.5721	0.5789	0.5861 (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							
G			39.3600	1.0536	41.4713		(27)
D			1.9900	1.1000	2.1890		(26a)
RL			0.9600	1.0536	1.0115		(27a)
GF			80.8400	0.1200	9.7008	110.0000	8892.4000 (28a)
EW	192.3100	41.3500	150.9600	0.1500	22.6440	60.0000	9057.6000 (29a)
C	67.2400		67.2400	0.1000	6.7240	9.0000	605.1600 (30)
PR	14.6000	0.9600	13.6400	0.1200	1.6368	9.0000	122.7600 (30)
FR	2.9100		2.9100	0.1200	0.3492	9.0000	26.1900 (30)
Total net area of external elements Aum (A, m2)			357.9000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		85.7266		(33)
Main dwelling							
IW			306.5000			75.0000	22987.5000 (32c)
IF			67.2400			18.0000	1210.3200 (32d)
IC			67.2400			9.0000	605.1600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	43507.0900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							293.8080 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

E2 Other lintels (including other steel lintels)	21.3000	0.0540	1.1502
E3 Sill	21.3000	0.0400	0.8520
E4 Jamb	54.2800	0.0490	2.6597
E5 Ground floor (normal)	41.5000	0.0380	1.5770
E6 Intermediate floor within a dwelling	32.8000	0.0120	0.3936
E10 Eaves (insulation at ceiling level)	32.8000	0.0420	1.3776
E18 Party wall between dwellings	0.0000	0.0790	0.0000
E12 Gable (insulation at ceiling level)	0.0000	0.0870	0.0000
E16 Corner (normal)	28.3000	0.0400	1.1320
E11 Eaves (insulation at rafter level)	6.4200	0.0310	0.1990
E13 Gable (insulation at rafter level)	4.5500	0.0910	0.4140
E14 Flat roof	4.8300	0.1000	0.4830
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0630	-0.4725
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.7657 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	95.4922 (37)

Assumed occupancy													2.9311 (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	84.6330	83.3761	81.6061	78.3425	75.8988	73.1891	71.7254	73.4830	75.3968	78.2963	81.6270	84.3469	(42b)
Hot water usage for other uses	44.6479	43.0243	41.4008	39.7772	38.1537	36.5301	36.5301	38.1537	39.7772	41.4008	43.0243	44.6479	(42c)
Average daily hot water use (litres/day)													119.0571 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.2809	126.4004	123.0068	118.1197	114.0524	109.7192	108.2555	111.6367	115.1740	119.6970	124.6514	128.9948	(44)
Energy content (annual)	204.7493	179.9925	189.0569	161.7000	153.5365	134.9125	130.9257	138.2296	142.0210	162.4277	177.5887	201.9746	(45)
Distribution loss (46)m = 0.15 x (45)m	30.7124	26.9989	28.3585	24.2550	23.0305	20.2369	19.6388	20.7344	21.3032	24.3642	26.6383	30.2962	(46)
Water storage loss (or HIU loss):													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	254.9631	225.3469	239.2707	210.2940	203.7503	183.5065	181.1395	188.4434	190.6150	212.6415	226.1827	252.1884	(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	254.9631	225.3469	239.2707	210.2940	203.7503	183.5065	181.1395	188.4434	190.6150	212.6415	226.1827	252.1884	(64)
Total per year (kWh/year)													2568.3420 (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	86.6891	76.6565	81.4713	71.7748	69.6608	62.8680	62.1427	64.5712	65.2316	72.6171	77.0578	85.7665	(65)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.5574	146.5574	146.5574	146.5574	146.5574	146.5574	146.5574	146.5574	146.5574	146.5574	146.5574	146.5574	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	160.6096	177.8177	160.6096	165.9632	160.6096	165.9632	160.6096	160.6096	165.9632	160.6096	165.9632	160.6096	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.4264	321.7307	313.4040	295.6776	273.3011	252.2704	238.2206	234.9163	243.2429	260.9694	283.3459	304.3766	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	(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)	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	(71)
Water heating gains (Table 5)	116.5176	114.0721	109.5045	99.6873	93.6301	87.3167	83.5251	86.7893	90.5994	97.6037	107.0248	115.2775	(72)
Total internal gains	662.5208	680.5878	650.4853	628.2953	594.5080	572.5175	549.3225	549.2824	566.7728	586.1499	623.3011	647.2309	(73)

[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	1.5000	11.2829	0.5700	0.7000	0.7700	4.6797 (75)
Southeast	18.7300	36.7938	0.5700	0.7000	0.7700	190.5544 (77)

7. Mean internal temperature (heating season)

21.0000 (85)

Full SAP Calculation Printout

சரிசுதரண பிழை	சரிசுதரண பிழை	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	5.6509	5.6646	70.1713	71.1391	71.3231	72.1925	72.1925	72.3559	71.8551	71.3231	70.9518	70.5677
util living area	0.9985	0.9943	0.9799	0.9203	0.7757	0.5696	0.4154	0.4706	0.7392	0.9602	0.9957	0.9990 (86)
Living	20.0358	20.2089	20.4363	20.7096	20.8793	20.9373	20.9453	20.9442	20.9085	20.6620	20.2957	20.0121
Non living	18.8182	19.0412	19.3298	19.6682	19.8462	19.9031	19.9072	19.9090	19.8812	19.6232	19.1633	18.7965
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	20.5068	20.2089	20.4363	20.7096	20.8793	20.9373	20.9453	20.9442	20.9085	20.6620	20.2957	20.1503 (87)
Th 2	19.9442	19.9470	19.9497	19.9624	19.9648	19.9760	19.9760	19.9781	19.9717	19.9648	19.9600	19.9549 (88)
util rest of house	0.9979	0.9920	0.9721	0.8918	0.7129	0.4834	0.3196	0.3679	0.6509	0.9396	0.9936	0.9986 (89)
MIT 2	19.4953	19.0412	19.3298	19.6682	19.8462	19.9031	19.9072	19.9090	19.8812	19.6232	19.1633	19.0052 (90)
Living area fraction									fLA = Living area / (4) =			0.1155 (91)
MIT	19.6122	19.1761	19.4577	19.7885	19.9656	20.0226	20.0271	20.0286	19.9999	19.7432	19.2942	19.1376 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6122	19.1761	19.4577	19.7885	19.9656	20.0226	20.0271	20.0286	19.9999	19.7432	19.2942	19.1376 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9898	0.9673	0.8861	0.7130	0.4874	0.3244	0.3730	0.6535	0.9338	0.9917	0.9981	(94)
Useful gains	979.4455	1227.2294	1409.1511	1502.3174	1319.8175	900.2757	573.1556	604.8399	955.9621	1135.0206	1000.1372	916.8116	(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	2652.5805	2465.8360	2231.6456	1849.7734	1400.5575	907.7679	573.7165	606.0730	992.3030	1549.2681	2077.0463	2558.1798	(97)
Space heating kWh	1244.8124	832.3437	611.9359	250.1683	60.0706	0.0000	0.0000	0.0000	0.0000	308.2002	775.3745	1221.1780	(98a)
Space heating requirement - total per year (kWh/year)												5304.0836	
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	1244.8124	832.3437	611.9359	250.1683	60.0706	0.0000	0.0000	0.0000	0.0000	308.2002	775.3745	1221.1780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5304.0836	
Space heating per m2											(98c) / (4) =	35.8190	(99)

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

0.0000 (201)

1.0000 (202)

251.8883 (206)

0.0000 (207)

[illegible]

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6096	177.8177	160.6096	165.9632	160.6096	165.9632	160.6096	160.6096	165.9632	160.6096	165.9632	160.6096 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	318.4264	321.7307	313.4040	295.6776	273.3011	252.2704	238.2206	234.9163	243.2429	260.9694	283.3459	304.3766 (68)
Pumps, fans	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557	37.6557 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459	-117.2459 (71)
Total internal gains	154.5460	152.1005	147.5329	137.7157	131.6585	125.3451	121.5535	124.8177	128.6278	135.6321	145.0532	153.3059 (72)
	703.5492	721.6162	691.5137	669.3237	635.5364	610.5459	587.3509	587.3108	604.8012	627.1783	664.3295	688.2593 (73)

Final SAP Calculation Summary



[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					1.3000	11.2829	0.6300	0.7000			0.7700	4.4827 (75)
Southeast					16.2700	36.7938	0.6300	0.7000			0.7700	182.9508 (77)
Southwest					6.7300	36.7938	0.6300	0.7000			0.7700	75.6767 (79)
Northwest					9.8900	11.2829	0.6300	0.7000			0.7700	34.1028 (81)
Northeast					0.4200	17.4137	0.6300	0.7000			1.0000	2.9028 (82)
Southwest					0.4200	38.2331	0.6300	0.7000			1.0000	6.3734 (82)

Solar gains	306.4892	537.1035	774.3419	1024.7722	1206.8731	1223.9610	1169.2973	1029.5981	860.5168	604.2991	369.8541	260.5045 (83)
Total gains	1010.0384	1258.7197	1465.8557	1694.0959	1842.4095	1834.5069	1756.6482	1616.9089	1465.3180	1231.4774	1034.1836	948.7638 (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	65.4664	65.6463	65.8236	66.6693	66.8299	67.5881	67.5881	67.7304	67.2940	66.8299	66.5058	66.1702
alpha	5.3644	5.3764	5.3882	5.4446	5.4553	5.5059	5.5059	5.5154	5.4863	5.4553	5.4337	5.4113
util living area	0.9983	0.9942	0.9816	0.9312	0.8041	0.6055	0.4449	0.5016	0.7672	0.9634	0.9954	0.9988 (86)
MIT	19.7010	19.9271	20.2331	20.6130	20.8741	20.9788	20.9967	20.9939	20.9276	20.5635	20.0601	19.6693 (87)
Th 2	19.8829	19.8856	19.8882	19.9007	19.9031	19.9140	19.9140	19.9160	19.9098	19.9031	19.8983	19.8934 (88)
util rest of house	0.9976	0.9919	0.9741	0.9048	0.7413	0.5112	0.3368	0.3867	0.6763	0.9436	0.9932	0.9983 (89)
MIT 2	18.3812	18.6715	19.0597	19.5287	19.8082	19.9040	19.9132	19.9143	19.8674	19.4833	18.8518	18.3482 (90)
Living area fraction									fLA = Living area / (4) =			0.1155 (91)
MIT	18.5337	18.8166	19.1952	19.6540	19.9313	20.0282	20.0384	20.0391	19.9899	19.6081	18.9914	18.5009 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5337	18.8166	19.1952	19.6540	19.9313	20.0282	20.0384	20.0391	19.9899	19.6081	18.9914	18.5009 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9887	0.9678	0.8976	0.7431	0.5215	0.3493	0.4000	0.6837	0.9365	0.9904	0.9973 (94)
Useful gains	1006.3467	1244.5405	1418.7249	1520.5468	1369.0657	956.6455	613.5768	646.7871	1001.7954	1153.3082	1024.2613	946.2411 (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	2627.5819	2562.0042	2330.8645	1949.4075	1488.5246	970.5991	614.8121	649.3299	1057.7718	1629.0026	2160.8787	2611.9097 (97)
Space heating kWh	1206.1989	885.3356	678.6319	308.7797	88.8774	0.0000	0.0000	0.0000	0.0000	353.9166	818.3645	1239.2575 (98a)
Space heating requirement - total per year (kWh/year)												5579.3623
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	1206.1989	885.3356	678.6319	308.7797	88.8774	0.0000	0.0000	0.0000	0.0000	353.9166	818.3645	1239.2575 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5579.3623
Space heating per m2										(98c) / (4) =		37.6780 (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	1206.1989	885.3356	678.6319	308.7797	88.8774	0.0000	0.0000	0.0000	0.0000	353.9166	818.3645	1239.2575 (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)	1306.8244	959.1936	735.2458	334.5392	96.2919	0.0000	0.0000	0.0000	0.0000	383.4416	886.6355	1342.6408 (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	263.3781	232.9475	247.6857	218.4375	212.1653	191.6501	189.5545	196.8584	198.7586	221.0565	234.3263	260.6034 (64)
Efficiency of water heater (217)m	87.0407	86.7617	86.2005	84.8358	82.2614	79.8000	79.8000	79.8000	79.8000	85.1096	86.6253	79.8000 (216)
Fuel for water heating, kWh/month	302.5920	268.4913	287.3368	257.4828	257.9159	240.1630	237.5369	246.6897	249.0709	259.7316	270.5057	299.2232 (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	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.3715	26.7719	24.1051	17.6604	13.6414	11.1452	12.4442	16.1754	21.0102	27.5666	31.1364	34.2990	34.2990	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-68.8106	-93.7260	-130.1812	-141.2144	-147.9683	-136.4642	-134.6006	-129.0161	-118.7518	-104.4934	-74.3956	-59.8680	-59.8680	(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	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	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-49.5551	-102.7997	-201.7794	-299.5277	-392.7983	-393.6305	-389.1527	-331.1074	-244.7521	-146.0036	-65.8098	-39.3129	-39.3129	(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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													6044.8129	(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													3176.7398	(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)													269.3271	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3995.7195	(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													5581.1602	(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	6044.8129	0.2100	1269.4107 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3176.7398	0.2100	667.1154 (264)
Space and water heating			1936.5261 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	269.3271	0.1443	38.8722 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1339.4903	0.1354	-181.3127
PV Unit electricity exported	-2656.2293	0.1262	-335.3125
Total			-516.6252 (269)
Total CO2, kg/year			1470.7024 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300 (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	6044.8129	1.1300	6830.6386 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3176.7398	1.1300	3589.7160 (278)
Space and water heating			10420.3546 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	269.3271	1.5338	413.1029 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1339.4903	1.5003	-2009.6488
PV Unit electricity exported	-2656.2293	0.4634	-1230.8662
Total			-3240.5150 (283)
Total Primary energy kWh/year			7723.0433 (286)
Target Primary Energy Rate (TPER)			52.1500 (287)

Plot Reference

Sample 5

Issued on Date

12/01/2026

Assessment Reference

Sample 5

Plot Type Ref

Plot Address

SAP Version

10.2

SAP Rating

84 B

DER

3.28

TER

10.02

Environmental

97 A

% DER < TER

67.27

CO₂ Emissions (t/year)

0.45

DFEE

38.80

TFEE

43.92

Compliance Check

See BREL

% DFEE < TFEE

11.66

% DPER < TPER

35.61

DPER

33.85

TPER

52.58

Energy Saving Calculations Summary



Assessor Name

Mr. George Farr

Assessor ID

T355-0001

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 (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	80.2400 (1b)	x 2.5000 (2b)	= 200.6000 (1b) - (3b)
First floor	80.2400 (1c)	x 2.7000 (2c)	= 216.6480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	160.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	417.2480 (5)

2. Ventilation rate

	m ³ 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	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 50.0000 / (5) = 0.1198 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3198 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3198 (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	5.0000	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	0.4078	0.3998	0.3918	0.3518	0.3438	0.3038	0.3038	0.2958	0.3198	0.3438	0.3598	0.3758 (22b)
Effective ac	0.5831	0.5799	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5511	0.5591	0.5647	0.5706 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
G			41.5200	1.0536	43.7471		(27)
D			1.9900	1.1000	2.1890		(26a)
GF			80.2400	0.1200	9.6288	110.0000	8826.4000 (28a)
EW	210.6000	43.5100	167.0900	0.1500	25.0635	60.0000	10025.4000 (29a)
C	80.2400		80.2400	0.1000	8.0240	9.0000	722.1600 (30)
Total net area of external elements Aum(A, m ²)			371.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.6524		(33)
Main dwelling							
IW			300.3500			75.0000	22526.2500 (32c)
IF			80.2400			18.0000	1444.3200 (32d)
IC			80.2400			9.0000	722.1600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	44266.6900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							275.8393 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				24.4100	0.0540	1.3181	
E3 Sill				24.4100	0.0400	0.9764	
E4 Jamb				57.8800	0.0490	2.8361	

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					3.9500	11.2829	0.5700	0.7000			0.7700	12.3233 (75)
Southeast					14.5400	36.7938	0.5700	0.7000			0.7700	147.9264 (77)
Southwest					5.2400	36.7938	0.5700	0.7000			0.7700	53.3105 (79)
Northwest					17.7900	11.2829	0.5700	0.7000			0.7700	55.5015 (81)
Solar gains	269.0615	480.8399	717.7463	989.6236	1200.0111	1231.6031	1170.6383	1007.5233	810.9280	547.5650	326.3764	227.6059 (83)
Total gains	981.1740	1211.8612	1417.5842	1666.7128	1842.1319	1851.0517	1766.0677	1602.7885	1424.2694	1180.8301	997.9881	923.8372 (84)

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	286.2634 (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	3482.8215 (238)

Individual heating systems including micro-CHP			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2262.8397	0.1565	354.0794 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	933.7183	0.1409	131.5549 (264)
Space and water heating			485.6343 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	286.2634	0.1443	41.3167 (268)
Total CO2, kg/year			526.9509 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2800 (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	2262.8397	1.5793	3573.6346 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	933.7183	1.5210	1420.1603 (278)
Space and water heating			4993.7948 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	286.2634	1.5338	439.0804 (282)
Total Primary energy kWh/year			5432.8753 (286)
Dwelling Primary energy Rate (DPER)			33.8500 (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	80.2400 (1b)	x 2.5000 (2b)	= 200.6000 (1b) - (3b)		
First floor	80.2400 (1c)	x 2.7000 (2c)	= 216.6480 (1c) - (3c)		
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	160.4800		(4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	417.2480 (5)		

2. Ventilation rate												
m3 per hour												
Number of open chimneys												
Number of open flues												
Number of chimneys / flues attached to closed fire												
Number of flues attached to solid fuel boiler												
Number of flues attached to other heater												
Number of blocked chimneys												
Number of intermittent extract fans												
Number of passive vents												
Number of flueless gas fires												
										Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =										40.0000 / (5) = 0.0959 (8)		
Pressure test										Yes		
Pressure Test Method										Blower Door		
Measured/design AP50										5.0000 (17)		
Infiltration rate										0.3459 (18)		
Number of sides sheltered										0 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] = 1.0000 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) = 0.3459 (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												
	0.4410	0.4323	0.4237	0.3805	0.3718	0.3286	0.3286	0.3199	0.3459	0.3718	0.3891	0.4064 (22b)
Effective ac	0.5972	0.5935	0.5898	0.5724	0.5691	0.5540	0.5540	0.5512	0.5598	0.5691	0.5757	0.5826 (25)

3. Heat losses and heat loss parameter

Table 2.6b Calculation Summary

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 Semi-glazed door						1.9900	1.0000	1.9900				(26a)
TER Opening Type						38.1300	1.1450	43.6603				(27)
GF						80.2400	0.1300	10.4312				(28a)
EW			210.6000	40.1200		170.4800	0.1800	30.6864				(29a)
C			80.2400			80.2400	0.1100	8.8264				(30)
Total net area of external elements Aum(A, m2)						371.0800						(31)
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		95.5943				(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												275.8393 (35)
List of Thermal Bridges												
K1 Element							Length	Psi-value		Total		
E2 Other lintels (including other steel lintels)							24.4100	0.0500		1.2205		
E3 Sill							24.4100	0.0500		1.2205		
E4 Lintel							57.8800	0.0500		2.8940		
E5 Intermediate floor within a dwelling							40.5000	0.1600		6.4800		
E10 Eaves (insulation at ceiling level)							40.5000	0.0000		0.0000		
E12 Gable (insulation at ceiling level)							30.2700	0.0600		1.8162		
E16 Corner (normal)							10.2300	0.0600		0.6138		
E17 Corner (inverted - internal area greater than external area)							26.0000	0.0900		2.3400		
							5.2000	-0.0900		-0.4680		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												16.1170 (36)
Point Thermal bridges										(36a) =		0.0000
Total fabric heat loss										(33) + (36) + (36a) =		111.7113 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	82.2339	81.7140	81.2044	78.8110	78.3632	76.2785	76.2785	75.8925	77.0815	78.3632	79.2691	80.2162 (38)
Average = Sum(39)m / 12 =	193.9452	193.4253	192.9158	190.5223	190.0745	187.9898	187.9898	187.6038	188.7928	190.0745	190.9804	191.9275 (39)
	193.9452	193.4253	192.9158	190.5223	190.0745	187.9898	187.9898	187.6038	188.7928	190.0745	190.9804	190.5201
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2085	1.2053	1.2021	1.1872	1.1844	1.1714	1.1714	1.1690	1.1764	1.1844	1.1901	1.1960 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9496 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	129.8274	126.9348	123.5268	118.6191	114.5346	110.1830	108.7132	112.1086	115.6609	120.2030	125.1783	129.5401 (44)	
Energy content (annual)	205.6149	180.7534	189.8562	162.3836	154.1856	135.4829	131.4792	138.8139	142.6214	163.1144	178.3395	202.8285 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1985.4733	
Water storage loss (or HIU loss):	30.8422	27.1130	28.4784	24.3575	23.1278	20.3224	19.7219	20.8221	21.3932	24.4672	26.7509	30.4243 (46)	
Store volume												300.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												2.1127 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.1409 (55)	
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (56)	
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (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	264.2437	233.7085	248.4850	219.1211	212.8144	192.2204	190.1080	197.4427	199.3590	221.7432	235.0770	261.4573 (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	264.2437	233.7085	248.4850	219.1211	212.8144	192.2204	190.1080	197.4427	199.3590	221.7432	235.0770	261.4573 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2675.7803 (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)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	115.2700	102.4646	110.0302	99.3826	98.1697	90.4381	90.6199	93.0587	92.8117	101.1386	104.6879	114.3435 (65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.4790	147.4790	147.4790	147.4790	147.4790	147.4790	147.4790	147.4790	147.4790	147.4790	147.4790	147.4790	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.3085	185.2344	167.3085	172.8855	167.3085	172.8855	167.3085	167.3085	172.8855	167.3085	172.8855	167.3085	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	331.7079	335.1500	326.4760	308.0102	284.7004	262.7925	248.1567	244.7146	253.3885	271.8543	295.1641	317.0720	(69)
Pumps, fans	37.7479	37.7479	37.7479	37.7479	37.7479	37.7479	37.7479	37.7479	37.7479	37.7479	37.7479	37.7479	(70)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(71)
Water heating gains (Table 5)	-117.9832	-117.9832	-117.9832	-117.9832	-117.9832	-117.9832	-117.9832	-117.9832	-117.9832	-117.9832	-117.9832	-117.9832	(72)
Total internal gains	154.9328	152.4770	147.8901	138.0314	131.9486	125.6085	121.8009	125.0789	128.9051	135.9390	145.3999	153.6875	(73)
	724.1929	743.1051	711.9183	689.1707	654.2012	628.5301	604.5098	604.3457	622.4228	645.3455	683.6932	708.3118	(74)

[illegible]

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	(235d)
Annual totals kWh/year											
Space heating fuel - main system 1										6665.6138	(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										3181.2965	(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)										280.5606	(232)
Energy saving/generation technologies (Appendices M ,N and Q)											
PV generation										-3966.0630	(233)
Hydro electric generation (Appendix N)										0.0000	(234)
Electricity generated - Micro CHP (Appendix N)										0.0000	(235a)
Appendix Q - special features										0.0000	(235)
Energy saved or generated										-0.0000	(236)
Energy used										0.0000	(237)
Total delivered energy for all uses										6247.4079	(238)

Energy 3.0

Energy 3.0

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	6665.6138	0.2100	1399.7789 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3181.2965	0.2100	668.0723 (264)
Space and water heating			2067.8512 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	280.5606	0.1443	40.4936 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1362.1471	0.1353	-184.2482
PV Unit electricity exported	-2603.9160	0.1262	-328.5793
Total			-512.8275 (269)
Total CO2, kg/year			1607.4465 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0200 (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	6665.6138	1.1300	7532.1436 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3181.2965	1.1300	3594.8651 (278)
Space and water heating			11127.0087 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	280.5606	1.5338	430.3332 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1362.1471	1.4999	-2043.1485
PV Unit electricity exported	-2603.9160	0.4632	-1206.1439
Total			-3249.2924 (283)
Total Primary energy kWh/year			8438.1504 (286)
Target Primary Energy Rate (TPER)			52.5800 (287)