286-292 Wells Road
Energy & Sustainability Statement
For Planning

August 2025

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1.0 INTRODUCTION & CONTEXT

1.1 Introduction

Max Fordham have been commissioned to provide consultancy advice for the proposed refurbishment of 286-292 Wells Road, Bristol, into a mixed use 3-storey development comprising 9no. 1/2 bedroom flats and 2no. commercial spaces. The total area of the development is ca. 800m2.

We have prepared this report to set out and highlight statements to address the Bristol City Council planning requirements and recommendations in relation to energy and sustainability. It is based on the design work carried out during the design stages up to this point.

We refer to Bristol City Council Policies, in particular Core Strategy Policies BCS 13, BCS 14 and 15 and the Sustainability & Climate Change Practice Note (July 2020) and subsequent Addendum (June 2023) which lay out issues of importance to the local authority, whilst respecting the historic nature of the development context.

The development will bring historic buildings up to modern usage standards in a sustainable way, reusing the existing buildings and materials where possible to minimise the embodied carbon of construction.

It is shown that the development is designed to reduce energy demand for heating; to provide efficient energy-using systems; and to generate energy renewably on site. The proposals result in a saving equating to 67% of the residual carbon emissions, thereby complying with the BCC energy and sustainability policies.

1.2 Planning Policy

The Climate Change Act 2008
Under the Climate Change Act 2008, the Government put in place legally binding carbon reduction targets of 35% by 2020 and 80% by 2050, compared to 1990 levels. Additionally, the UK has committed to contribute to global emission reduction to limit global temperature rise to as little as possible above 2°C. To meet these targets, the Government has set five-yearly carbon budgets which currently run until 2037. The carbon budgets restrict the amount of greenhouse gases the UK can legally emit in a five year period.

The construction and operation of UK buildings account for approximately 60% of national carbon dioxide emissions. Therefore, planning legislation seeks to mitigate the impact (in particular) of new construction in order to minimise these emissions and to meet the national targets.

The National Planning Policy Framework
The National Planning Policy Framework (NPPF) sets out the overarching planning policies on the delivery of sustainable development through the planning system. The NPPF was published in early 2012 – most recently updated in December 2024, re-introducing mandatory housing targets, amongst other changes. It sets out the Government's planning policies for England and how these are expected to be applied, moreover it compels planning authorities to facilitate and promote good quality and sustainable development.

Part L Building Regulations
The development is the refurbishment of an existing building. The commercial areas (commercial units and communal areas of flats) shall be assessed against *Building Regulations Approved Document Part L2 Buildings Other than Dwellings*. The flats shall be assessed against *Building Regulation Approved Document L1 Dwellings.*

The figures presented here to form the 'Part L baseline' from which renewable energy and efficiency improvements are judged are based on the Building Emission Rate (BER) of a Part L compliant scheme, before further energy and efficiency improvements have been included.

Local Policy
Bristol City Council's Core Strategy (2011) contains policies BCS13 to 16 which relate to environmental sustainability. BCS13 addresses mitigating and adapting to climate change, through:

- efficient systems, passive design approaches and high-performance fabric,
- use of heat networks,
- encouraging low-carbon transport,
- minimising flooding risk,
- considering green infrastructure,
- mitigating against future climates without increasing carbon emissions.

The policy asks for a Sustainability Statement to lay this out, which would also provide evidence for compliance with other related policies.

BCS14 sets out the energy hierarchy that:

- demand should be minimised first,
- followed by the provision of renewable energy and 'low-carbon' energy sources.

On site renewable energy is required, where feasible, to reduce the residual carbon emissions by 20%. The residual carbon emissions are the predicted regulated emissions after accounting for heat networks and efficient systems.

More guidance on compliance with BCS14 is provided in the Climate Change and Sustainability Practice Note (2020) and subsequent Addenda which structures the energy and carbon predictions for the development into a table. The most recent addendum was issued in June 2023. See section 2 for the proposed project response to BCS14.

Policy BCS15 considers sustainable design generally and requires a BREEAM assessment for major and super-major developments. As the scheme does not meet the definition of major or super-major, a BREEAM assessment has not been undertaken. See section 4 for response to BCS15 requirements.

Policy BCS16 is related to sustainable design in that it covers flood risk and resilience to future climate change. It is referenced in the Climate Change and Sustainability Practice Note. Note, due to the project's small scale, location and history a flood risk assessment is not proposed to be undertaken.

In November 2018 the Council passed a motion to pledge to make Bristol carbon neutral by 2030. In due course this will have an impact on planning policy for buildings. The Local Plan underwent a public consultation in early 2019 and again in late 2023. Many comments were received in relation to carbon emissions and environmental sustainability. However, specific, formal changes are not yet adopted.

1.3 Summary of Design Proposals

Delivery of Heat, Hot Water and Electricity

- Grid electricity derived from the existing infrastructure; requirements partially offset by new PV array.
- Individual heat pumps to provide both heating and hot water to flats.
- Local reversible VRF heat pumps providing both heat and cooling to the commercial units.
- Small/auxiliary spaces heated via electric radiators.
- Hot water delivered by electric point-of-use water or small storage heaters to commercial areas.

Ventilation

- Intermittent mechanical extract ventilation from wet areas (kitchens, bathrooms) in flats
- Intermittent mechanical extract ventilation from wet areas (WCs) in communal and commercial spaces
- Spaces can be naturally ventilated where and when appropriate, to minimise power usage for fans and air conditioning.

Electricity, Comms and Lighting

- All new electrical distribution.
- All new lighting, to be LED.
- Metering to enable segregation of energy uses in commercial areas.
- New high speed internet connections to all flats and commercial areas.

1.4 Summary of Environmental Planning Issues

Energy Supply

- The new and refurbished buildings will be fossil-fuel free and supplied with grid electricity only.
- PV array will be provided to generate renewable energy locally and supplied to commercial areas and to flats.

Energy Efficient Systems

- Individual heat pumps utilising low Global Warming Potential (GWP) refrigerant to provide both heating and hot water to flats.
- Local reversible low GWP VRF reversible heat pumps providing both heat and cooling to the commercial units.
- Point of use electric water heaters to provide hot water in commercial areas to remove recirculation losses.

External Lighting

- Minimal scheme is to be developed, which will reflect ILP guidance.

Noise

- Silencing to be provided where required to meet BS4142 “complaints unlikely”.

2.0 ENERGY (BSC14)

This section of the report details the approach taken for the design of the development to contribute to both mitigating and adapting to climate change.

2.1 Scope

The project includes the refurbishment and reconfiguration of an existing commercial space into a mixed used development of flats and commercial units.

Policy BCS14:

> *Proposals for the utilisation, distribution and development of renewable and low-carbon sources of energy, including large-scale freestanding installations, will be encouraged. In assessing such proposals the environmental and economic benefits of the proposed development will be afforded significant weight, alongside considerations of public health and safety and impacts on biodiversity, landscape character, the historic environment and the residential amenity of the surrounding area.*
>
> *Development in Bristol should include measures to reduce carbon dioxide emissions from energy use in accordance with the following energy hierarchy:*
>
> 1. *Minimising energy requirements;*
> 2. *Incorporating renewable energy sources;*
> 3. *Incorporating low-carbon energy sources.*
>
> *Consistent with stage two of the above energy hierarchy, development will be expected to provide sufficient renewable energy generation to reduce carbon dioxide emissions from residual energy use in the buildings by at least 20%. An exception will only be made in the case where a development is appropriate and necessary but where it is demonstrated that meeting the required standard would not be feasible or viable.*
>
> *The use of combined heat and power (CHP), combined cooling, heat and power (CCHP) and district heating will be encouraged. Within Heat Priority Areas, major development will be expected to incorporate, where feasible, infrastructure for district heating, and will be expected to connect to existing systems where available.*
>
> *New development will be expected to demonstrate that the heating and cooling systems have been selected according to the following heat hierarchy:*
>
> 1. *Connection to existing CHP/CCHP distribution networks*
> 2. *Site-wide renewable CHP/CCHP*
> 3. *Site-wide gas-fired CHP/CCHP*
> 4. *Site-wide renewable community heating/cooling*
> 5. *Site-wide gas-fired community heating/cooling*
> 6. *Individual building renewable heating*

Policy BCS14 was supplemented by an addendum in 2023, following updates to the Building Regulations Approved Documents in relation to energy efficiency.

2.2 Low Energy/Carbon Principles

Our approach to sustainability and environmental design for the development is focused on making energy savings in the most cost-effective manner possible. To achieve this, 'passive' measures have been applied first before considering 'active' methods. Passive measures are measures to improve energy performance without requiring 'operating technology' and include:

- Utilising high-performance building fabric either by refurbishing the existing fabric by adding insulation or by replacing fabric with better performing alternatives.
- Installing all new fabric elements to meet latest building regulations.
- Improving the overall air-tightness performance to minimize unwanted heat gain or loss through air permeating through the envelope
- Utilising solar controlled glazing to reduce solar gains but not daylight availability.
- Incorporating natural ventilation options where appropriate
- Maximising daylight penetration into new spaces to reduce the amount of time artificial lighting is required.

These measures reduce the amount, size and complexity of plant required by reducing gains and losses. As this is an existing building refurbishment the extent of the passive measure is constrained compared to a new build, however it is proposed they are incorporated where feasible.

Once passive measures have been incorporated, active measures should, where possible, be applied in the following order:

1. Agree suitable environmental conditions
2. Provide low energy fittings and terminal units
3. Incorporate effective and user-friendly controls
4. Provide energy efficient central plant and distribution systems
5. incorporate on-site renewables to meet residual loads

Applying measures in this order ensures that internal loads are further reduced so that plant sizes can be minimised and additional costs saved.

2.3 Using Less Energy

Building Form and Orientation
As the building is existing there is no opportunity to change the orientation of the building. The form factor of the existing buildings is not bad but not brilliant, due to the number of stepped roofs and convoluted external wall, however this is partially mitigated by connection to buildings to the west, limiting total external wall area exposed to the elements.

Insulating the New and Existing Building Fabric
For a typical building, heat is lost through by:

- conduction through the building fabric
- uncontrolled air infiltration through gaps

Maximising the fabric performance is very important in terms of reducing overall energy use and the CO_2 emissions of the building.

The measure of how efficient the building fabric is, is the "U-value". U-values are a measure of the heat loss through an element of building fabric. The lower the U-value, the lower the heat loss. The measure of how airtight the building is its "air permeability", measured in m3/m2.hr @ 50Pa. Again, the lower the air permeability, the lower the heat loss.

For existing elements in the accommodation areas of the development, the minimum allowable (limiting) U-values are given in Table 4.3 of Part L1. For new elements, the minimum U-values are given in Table 4.2 of Part L1.

Table 4.3 Limiting U-values for existing elements in existing dwellings

Element	U-value[1] W/(m²·K)	
	(a) Threshold	(b) Improved
Roof[2][3][4]	0.35	0.16
Wall – cavity insulation[2][5]	0.70	0.55
Wall – internal or external insulation[2][6]	0.70	0.30
Floor[7][8]	0.70	0.25

NOTES:

1. Area-weighted average values.
2. For dormer windows, 'roof' includes the roof parts of the windows and 'wall' includes the wall parts (cheeks).
3. If meeting such a standard would limit head room, a lesser standard may be appropriate. In such cases, both of the following should be achieved.
   a. The depth of the insulation plus any required air gap should be at least to the depth of the rafters.
   b. The insulant should be chosen to achieve the lowest practicable U-value.
4. If there are problems with the load-bearing capacity of the frame or height of the upstand, for a flat roof or roof with integral insulation, a lesser standard may be appropriate.
5. This applies only to a wall that is suitable for cavity insulation. Where this is not the case, it should be treated as 'wall – internal or external insulation'.
6. If meeting such a standard would reduce the internal floor area of the room bounded by the wall by more than 5%, a lesser standard may be appropriate.
7. The U-value of the floor of an extension may be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.
8. If meeting such a standard would create significant problems in relation to adjoining floor levels, a lesser standard may be appropriate.

Table 4.2 Limiting U-values for new fabric elements in existing dwellings

Element type	Maximum U-value[1] W/(m²·K)
Roof[2]	0.15
Wall[2][3]	0.18
Floor[4][5]	0.18
Swimming pool basin[6]	0.25
Window[7][8][9]	1.4 or Window Energy Rating[10] Band B minimum
Rooflight[11][12]	2.2
Doors with >60% of internal face glazed[13]	1.4 or Doorset Energy Rating[10] Band C minimum
Other doors[13][14]	1.4 or Doorset Energy Rating[10] Band B minimum

NOTES:

1. Area-weighted average values, except for windows, doors, roof windows and rooflights.
2. For dormer windows, 'roof' includes the roof parts of the windows and 'wall' includes the wall parts (cheeks).
3. If meeting such a standard would reduce the internal floor area of the room bounded by the wall by more than 5%, a lesser provision may be appropriate.
4. If meeting such a standard would create significant problems in relation to adjoining floor levels, a lesser provision may be appropriate.
5. The U-value of the floor of an extension may be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.
6. The U-value of a swimming pool basin (walls and floor) calculated according to **BS EN ISO 13370**.
7. If other performance (e.g. wind load, safety, security or acoustic attenuation) requires thicker glass to be used, an equivalent window unit with standard thickness (6mm) glazing should be shown to meet the required standard.
8. Including roof windows and curtain walling.
9. For timber windows, a maximum U-value of 1.6 W/(m²·K) or Window Energy Rating Band C is permissible until 14 June 2023. This is to give manufacturers time to transition to the standard in this Table 4.2. From 15 June 2023 the full standard of 1.4 W/(m²·K) or Window Energy Rating Band B applies.
10. The methods for calculating Window Energy Rating and Doorset Energy Rating are set out in the Glass and Glazing Federation's Glazing Manual Data Sheet 2.3, Guide to the Calculation of Energy Ratings for Windows, Roof Windows and Doors.
11. U-values for rooflights or rooflight-and-kerb assemblies should be based on the outer developed surface area, which is often greater than the area of the roof opening. Further guidance on U_d-values is given in the Building Research Establishment's BR 443 and the National Association of Rooflight Manufacturers' Technical Document NTD02.
12. The limiting value for rooflights also applies to kerbs that are supplied as part of a single rooflight-and-kerb assembly sourced from the same supplier and for which the supplier can provide a combined U_d-value for the assembly. An upstand built on site should have a maximum U-value of 0.35W/(m²·K).
13. For timber doors, a maximum U-value of 1.8 W/(m²·K) or Doorset Energy Rating Band E is permissible until 14 June 2023. This is to give manufacturers time to transition to the standard in this Table 4.2. From 15 June 2023 the full standard of 1.4 W/(m²·K) applies.
14. For external fire doorsets, as defined in Appendix A of Approved Document B, Volume 1, a maximum U-value of 1.8W/(m²·K) is permissible.

For existing elements in the commercial areas of the development, the minimum allowable (limiting) U-values are given in Table 4.2 of Part L2. For new elements, the limiting U-values are given in Table 4.1 of Part L2.

Table 4.2 Limiting U-values for existing elements in existing buildings

Element	U-value[1] W/(m²·K)	
	(a) Threshold	(b) Improved
Pitched roof – insulation at ceiling level[2]	0.35	0.16
Pitched roof – insulation at rafter level[2][3]	0.35	0.18
Flat roof or roof with integral insulation[2][4]	0.35	0.18
Wall – cavity insulation[2][5]	0.70	0.55
Wall – external or internal insulation[2][6]	0.70	0.30
Floors[7][8]	0.70	0.25

NOTES:

1. Area-weighted average values.
2. For dormer windows, 'roof' includes the roof parts of the window and 'wall' includes the wall parts (cheeks).
3. If meeting such a standard would limit head room, a lesser standard may be appropriate. In such cases, both of the following should be achieved.
   a. The depth of the insulation plus any required air gap should be at least to the depth of the rafters.
   b. The insulant should be chosen to achieve the lowest practicable U-value.
4. If there are problems with the load-bearing capacity of the frame or height of the upstand, for a flat roof or roof with integral insulation, a lesser standard may be appropriate.
5. This applies only to a wall suitable for cavity insulation. Where this is not the case, it should be treated as 'wall – external or internal insulation'.
6. If meeting such a standard would reduce the internal floor area of the room bounded by the wall by more than 5%, a lesser standard may be appropriate.
7. The U-value of the floor of an extension may be calculated using the exposed perimeter and floor area of either the whole enlarged building or the extension alone.
8. If meeting such a standard would create significant problems in relation to adjoining floor levels, a lesser standard may be appropriate.

Table 4.1 Limiting U-values for new or replacement elements in new and existing buildings and air permeability in new buildings

Element type	Maximum U-value[1] W/(m²·K) or air permeability
Roof (flat roof)[2]	0.18
Roof (pitched roof)[2]	0.16
Wall[2][3]	0.26
Floor[4][5]	0.18
Swimming pool basin[6]	0.25
Windows in buildings similar to dwellings[7][8]	1.6 or Window Energy Rating[9] Band B
All other windows,[8][10][11] roof windows, curtain walling	1.6
Rooflights[12][13]	2.2
Pedestrian doors (including glazed doors)[14]	1.6
Vehicle access and similar large doors	1.3
High-usage entrance doors	3.0
Roof ventilators (including smoke vents)	3.0
Air permeability (for new buildings)	8.0m³/(h·m²) @ 50Pa

NOTES:

1. Area-weighted average values, except for new windows, rooflights and doors in existing buildings.
2. For dormer windows, 'roof' includes the roof parts of the windows and 'wall' includes the wall parts (cheeks).
3. If meeting such a standard in an existing building would reduce by more than 5% the internal floor area of the room bounded by the wall, a lesser provision may be appropriate.
4. The U-value of the floor of an extension may be calculated using the exposed perimeter and floor area of either the whole enlarged building or the extension alone.
5. If meeting such a standard in an existing building, would create significant problems in relation to adjoining floor levels, a lesser provision may be appropriate.
6. The U-value of a swimming pool basin (walls and floor) calculated according to **BS EN ISO 13370**.
7. For example, student accommodation, care homes and similar uses where the occupancy levels and internal heat gains are essentially domestic in character.
8. If other performance (e.g. wind load, safety, security or acoustic attenuation) requires thicker glass to be used, an equivalent window unit with standard thickness glazing should be shown to meet the required standard.
9. The methods for calculating Window Energy Rating are set out in the Glass and Glazing Federation's Glazing Manual Data Sheet 2.3, Guide to the Calculation of Energy Ratings for Windows, Roof Windows and Doors.
10. No maximum U-value is set for display windows and similar glazing. There are no limits on the design of display windows and similar glazing, but for new buildings their impact must be taken into account in the calculation of primary energy and CO_2 emissions.
11. In buildings with high internal heat gains, the average U-value for windows can be relaxed from the values given above if this can be shown to be an appropriate way of reducing overall CO_2 emissions and primary energy. However, values should be no higher than 2.7W/(m²·K).
12. U-values for rooflights or rooflight-and-kerb assemblies should be based on the developed surface area of the rooflight (U_d values), which is often greater than the area of the roof opening. Further guidance on U_d-values is given in the Building Research Establishment's BR 443 and the National Association of Rooflight Manufacturers' Technical Document NTD02.
13. The limiting value for rooflights also applies to kerbs that are supplied as part of a single rooflight-and-kerb assembly sourced from the same supplier and for which the supplier can provide a combined U_d-value for the assembly. An upstand built on site should have a maximum U-value of 0.35W/m²·K.
14. For external fire doorsets, as defined in Appendix A of Approved Document B, Volume 2, in new and existing non-domestic buildings, a maximum U-value of 1.8W/(m²·K) is permissible.

For this development, the existing retained walls, floor and roof are proposed to be insulated and all glazing is to be new.

For this building it is proposed to improve upon the Building Regulations limiting values and provide fabric with thermal efficiency matching that of Part L1 Table D1, which is considered a good specification for buildings utilising heat pumps.

D1 This appendix provides a good practice specification for a dwelling built with a heat pump.

D2 By using this specification, the dwelling should pass the target primary energy rate and target emission rate. However, this should be checked through energy calculations.

Table D1 Summary of notional dwelling specification for new dwellings

Element or system	Reference value for target setting[1]
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 W/(m²·K)
Party walls	U = 0
Floors	U = 0.13 W/(m²·K)
Roofs	U = 0.11 W/(m²·K)
Opaque door (less than 30% glazed area)	U = 1.0 W/(m²·K)
Semi-glazed door (30–60% glazed area)	U = 1.0 W/(m²·K)
Windows and glazed doors with greater than 60% glazed area	U = 1.2 W/(m²·K) Frame factor = 0.7
Roof windows	U = 1.2 W/(m²·K), when in vertical position (for correction due to angle, see specification in SAP 10 Appendix R)
Rooflights	U = 1.7 W/(m²·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 m³/(h·m²) at 50 Pa
Main heating fuel (space and water)	**Mains electricity**
Heating system	**Air source heat pump** and radiators Design flow temperature = 45°C
Heat pump[3]	Space heating efficiency = 250% Water heating efficiency = 250%
Heating system controls	**Weather compensation** Either: – single storey dwelling in which the living area is greater than 70% of total floor area: programmer and room thermostat – any other dwelling: time and temperature zone control, thermostatic radiator valves

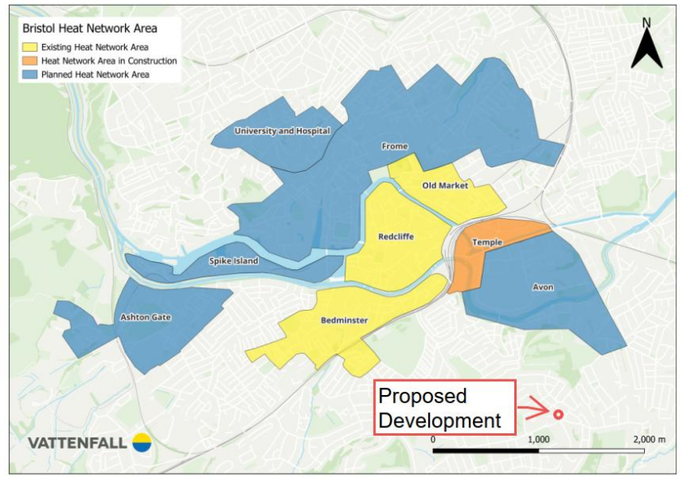
The following table summarises the proposed fabric performance for the development:

Area	Element	Baseline – Building Regulations Compliance	Proposed for Project
		U-values (W/m2/K) Infiltration (m3/mr.hr @ 50Pa)	
Commercial	Roof	0.16	**0.16**
	Wall	0.30	**0.30**
	Floor	0.25	**0.25**
	Windows / Doors	1.6	**1.6**
	Rooflights	2.2	**2.2**
	Infiltration	No Limit	**10**
Communal Areas	Roof	0.16	**0.16**
	Wall	0.30	**0.30**
	Floor	0.25	**0.25**
	Windows	1.6	**1.6**
	Rooflights	2.2	**2.2**
	Infiltration	No Limit	**10**
Flats	Roof	0.16	**0.16**
	Wall	0.30	**0.30**
	Floor	0.25	**0.25**
	Windows	1.4	**1.4**
	Rooflights	2.2	**2.2**
	Infiltration	No Limit (10)	**10**

Ventilation
Flats will be provided with intermittent extract from wet areas to remove odours, moisture and stale air. In addition, opening windows will allow occupants to control natural ventilation provision.

2.4 Supplying Energy Efficiently

Heat Networks and Combined Heat and Power
Although the development falls within the "Heat Priority Area" as identified in the Bristol Core Strategy (2011) is it not located within the currently planned Bristol Heat Network (BHN) and as such a connection to a heat network is not proposed.



Combined Heat and Power (CHP) is referenced in the Bristol Council policies, however this is an outdated technology which is not suitable for the following reasons:

- It relies on burning gas or other fuels, which increases local air pollution and greenhouse gas emissions
- The development is small, with a low heat demand unsuited to delivery via CHP.

Avon Street is within the Bristol Heat Priority area and there is a planned heat network running past the development site.

Heat Pumps
Heat pumps make use of the physical properties of refrigerants to extract heat from low grade heat sources such as the air, ground or water and transfer them to the space which is to be conditioned.

Heat pumps use electricity to drive a vapour compression cycle and can typically transfer 3-4 units of heat to the conditioned space for each unit of electricity consumed. They are therefore considerably more efficient at producing heat energy than gas or oil boilers, which are at best 90-95% efficient. As the grid-supplied electricity becomes less carbon intensive, the level of improvement when compared to gas boilers increases.

The 286-292 Wells Road project will make use of both air-to-water and air-to-air heat pumps to meet the space heating demands of the flats and commercial units respectively.

The heat pumps shall use low Global Warming Potential (GWP) refrigerants.

Hot Water
For the flats, the heat pumps which are to supply heating will also supply hot water. A recirculating hot water system is not proposed, to avoid the losses associated with such a system.

For the commercial areas it is proposed direct electric instantaneous or small storage units are used.

Low flow devices will limit the amount of hot water consumed, without impacting functionality or user experience.

Ventilation
Mechanical ventilation will be intermittent to minimise fan energy whilst maintaining a comfortable environment and adequately removing stale air, odour and moisture.

Lighting Energy
New and existing window openings and rooflights will provide natural lighting to spaces. In addition, all artificial lighting will be LED, with manual controls.

In accordance with Bristol Council Core Strategy (2011) Issue 13 and Policy BCS23, and SPD5 (2006) Policy P5, the design of all external lighting will be undertaken to avoid adversely impacting on the existing levels of light pollution.

2.5 Incorporating Renewable and Low-Carbon Energy Sources

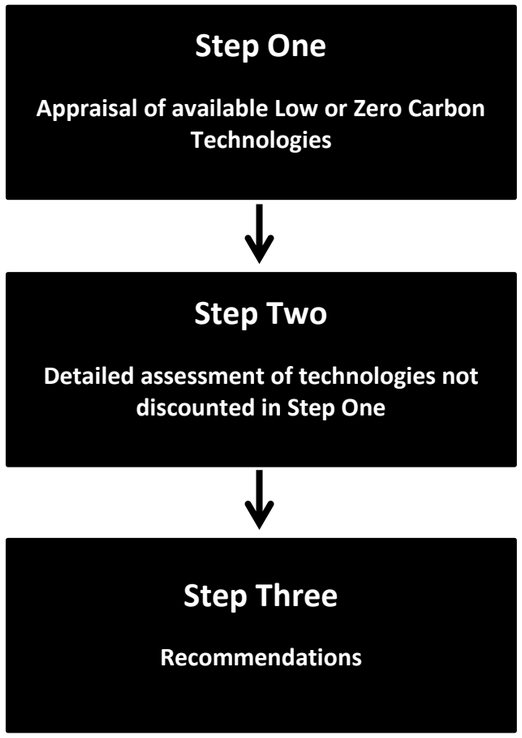
There are many low and zero carbon technologies (LZCT) available for use. It is possible to quickly discount some of these due to site constraints which would make their use impossible or extremely expensive.

This study aims to reduce the long list of possible LZCTs down to a short list of the most viable options. To do this efficiently, we have considered three steps of selection.

Step one identifies those LZCTs that can be discounted from the outset due to site constraints. This quickly reduces the long list down to a size where the more detailed information supplied in the next step will be of a digestible volume.

Step two will look, in more detail, at how each LZCT suits the site and the proposed building. Some LZCT will be discounted at this stage where they are deemed incompatible with the proposed building.

Step three will look at the carbon and economic impact of the remaining LZCTs to determine which is best suited to the property.



List of possible LZCTs (Table 1)

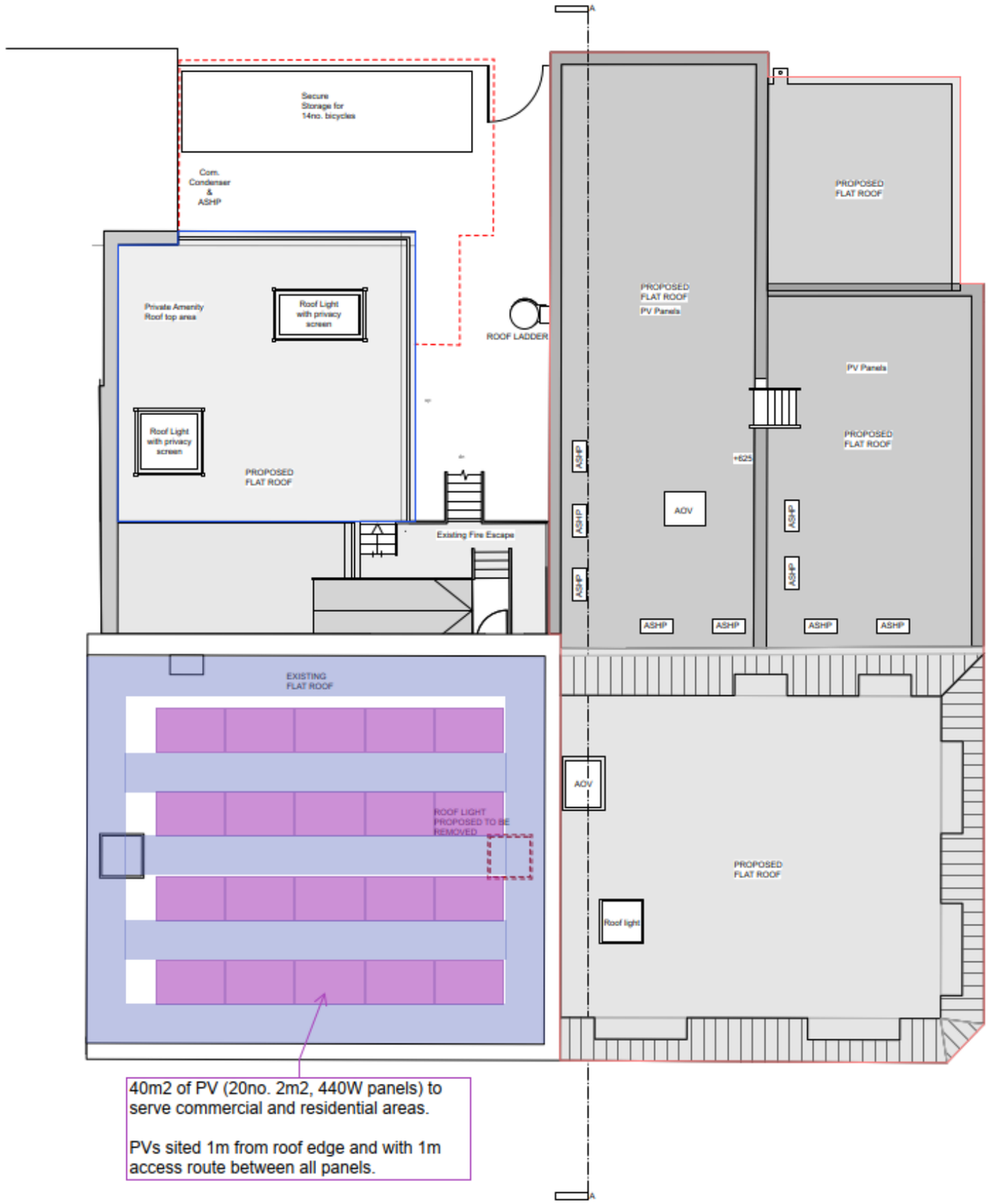
Category	Low or Zero Carbon Technology	Feasibility
Solar	Solar photovoltaics	**Yes**
	Solar thermal	**Yes**
Wind	Small scale wind energy	**No -** Inefficient and vibrations can cause structural problems
	Large scale wind energy	**No -** Insufficient space on site, city centre location
Water	Water Wheel	**No –** There is no local water source
	Micro hydro	
	Large scale hydro	
	Tidal	
	Wave	
District heating	Natural gas	**No** – There is no existing or proposed heat network and the site is too small to accommodate CHP or Biomass
	CHP	
	Biomass	
Heat pumps	Ground source heat pumps	**No** – There is very limited clear ground associated with the development for the required ground array
	Water source heat pumps	**No –** There is no local water source
	Air source heat pumps	**Yes**
	Sewage Heat Recovery	**No –** Unlikely to be viable at this scale
Biomass	Woodchip fired boiler	**No** – The site is too small to accommodate the required storage for biomass and there would be negative impacts on local air quality.
	Pellet fired boiler	
CHP	Natural gas	**No** – The site is too small to accommodate the required CHP plant and there would be negative impacts on local air quality.
Anaerobic Digestion	Powered by food waste	**No -** Insufficient waste generated on site to meet the demand and insufficient space.

The technologies which are not discounted in the above table are considered in more detail in the following table.

List of LZCT for further assessment (Table 2)

Category	Low or Zero Carbon Technology	Consideration	Feasibility
Solar	Solar photovoltaics	PVs produce high grade energy (in the form of electricity), require little maintenance and have relatively low visual impact. They are therefore often considered a safe option as a Low/Zero Carbon (LZC) technology for use in urban areas and are often acceptable in conservation areas if implemented sensitively. There is a significant area of south, east and west-facing roof associated with the development.	**Yes**
	Solar thermal	Solar thermal systems have relatively low visual impact. They are generally used to heat water for domestic hot water use. They are more efficient than PVs at converting solar energy into a useful form and are therefore more cost-effective in this regard. However, the systems require significant hot water storage to avoid overheating in summer and to provide useful amounts of hot water when the sun is not shining. Solar thermal systems do not eliminate the need for backup heating, as additional heat is required in winter and for avoidance of proliferation of Legionella. Solar thermal systems also require more regular maintenance than solar photovoltaics. They are a fairly uncommon technology in the UK, so competent maintenance contractors are few and far between. Solar thermal cells compete directly with solar photovoltaics for roof space and although solar thermal cells are feasible, it is felt that they are less beneficial to the development than maximising the onsite renewable electricity generation from solar photovoltaics. Electricity generated by solar photovoltaics is more versatile than hot water produced from solar thermal and can be used for many uses including running heat pumps for the efficient production of hot water.	**No** - less versatile than solar photovoltaics
Heat pumps	Air source heat pumps	Air Source heat pumps work by extracting heat from a low-grade heat source (the air) and using a reversed refrigeration cycle to reject higher grade heat (in the form of warm water) to the building. They consume electrical energy but can achieve high efficiencies of 300-400%. When properly implemented, the use of heat pumps can result in low carbon heating and are considered a renewable energy measure. Air source heat pumps do not require connection to the ground, however their efficiency in winter can be lower than ground source systems (as less heat is available from cold air than from the ground). Noise and visual planning issues become more significant due to them needing to be located externally. In Bristol the climate is maritime and relatively mild, so the number of hours that the air temperature is significantly lower than the ground is limited. Air source heat pumps can achieve good seasonal efficiencies and will produce significantly lower carbon emissions than the equivalent boiler installation – especially with current grid carbon intensity values reflecting de-carbonisation and on site renewable electricity generation.	**Yes**

Conclusions
The building will incorporate heat pumps to provide the space heating. Air-to-water heat pumps will supply the flats, with air-to-air heat pumps supplying the commercial areas. A solar photovoltaic array will be provided of, 40m², providing an estimated 5,200 kWh/annum, assuming south-west orientation and angled at 30 degrees to the horizontal, with minimal overshading.



282-292 Wells Road proposed PV array

2.6 Energy Calculation Templates

As required by the Practice Note, the emissions calculations use the National Calculation Methodology (NCM) with the tool IESVE for calculation of the energy consumption from the commercial and communal areas of the development. Standard Assessment Procedure (SAP 10.2) assessment using the Elmhurst tool have been used to calculate the energy consumption of the dwellings. The results are presented individually and combined.

It is worth highlighting that the Part L compliance calculations are simply a standard and do not predict actual performance.

The carbon emission factors used in the calculations are as follows:

Aspect	Fuel	Emissions Factor (kgCO2e/kWh)
Commercial (Part L2 / IES)	Gas	0.210
	Electricity	0.136
Domestic (Part L1 / SAP)	Gas	0.210
	Electricity	Varies monthly from 0.092 to 0.197

As the project is a refurbishment, the Part L limiting fabric parameters have been used to create the BCC "Baseline" model. The "Baseline" model does include some items considered as renewable technologies by BCC policy, namely heat pumps for space heating and cooling in commercial areas, as these are required to be included for Building Regulations compliance modelling. Therefore the "on-site renewables" figures only take into account the extra renewable generation capacity (PV) over and above that required to pass part L, to avoid overestimating the CO2 savings.

The "residual" energy use is calculated with improved fabric, airtightness, lighting, ventilation systems and cooling system efficiencies.

The "final" building model includes on-site renewable energy generation in the form of heat pumps, and PV achieving a 67% reduction in CO2 emissions on the "residual" emissions for the whole scheme.

Energy Efficiency Measures
The following U-Values were used in the IES / SAP calculations:

BCS Table 4.2.3	Part L Values						Notes
Element or System	Dwellings Limiting	Dwellings Notional	Dwellings Proposed	Non Dwellings Limiting	Non Dwellings Notional	Non Dwellings Proposed	
Wall	0.30	N/A	0.30	0.30	N/A	0.30	As the project is a refurbishment, there is no Building Regulations "notional" model which has to be bettered for Building Regulations compliance. The Building Regulations modelling has been undertaken purely to meet the requirements of Bristol Council Policy BCS14
Roof	0.16	N/A	0.16	0.16	N/A	0.16	
Floor	0.25	N/A	0.25	0.25	N/A	0.25	
Windows	1.4	N/A	1.4	1.6	N/A	1.6	
Doors	1.4	N/A	1.4	1.6	N/A	1.6	
Rooflights	2.2	N/A	2.2	2.2	N/A	2.2	
Permeability	N/A	N/A	10		N/A	10	

Commercial - NCM Templates
The following NCM templates were used in the IES calculations.

NCM Activity	Occupancy	Equipment
NCM Retail: Circulation	9.642 m²/person	2.08 W/m²
NCM Retail: Plant	9.428 m²/person	45.88 W/m²
NCM Retail: Cupboard	9.642 m²/person	0 W/m²
NCM Retail: Toilet	9.642 m²/person	4.17 W/m²
NCM Retail: Sales Area - General	8.556 m²/person	5.2 W/m²

Dwellings – Input Parameters
The following input parameters were included in the SAP calculations

SAP 10.2 Input Parameters		
Input	**Baseline - Gas Boiler (Table R1 reference values)**	**Actual – Heat Pumps**
System Efficiency	89.5%	228.38% Winter, 172.64% Summer
Ventilation	Natural	Natural
Lighting Efficacy	95 lm/W	95 lm/W
Air Permeability	10 m³/h·m² at 50 Pa	10 m³/h·m² at 50 Pa
DLF	1.5	1.5
Thermal Bridging	Y=0.2	Y=0.2

Energy Summary Table - Dwellings

SAP 10.2 Residential Results				
BCS Table 4.1.1 No District Heating Connection	**Regulated Energy Demand (MWh/yr)**	**Regulated CO2 Emissions (tonnes/yr)**	**CO2 saved (tonnes/yr)**	**% CO2 reduction**
Baseline - Part L Limiting Values	75.1	15.9		
Proposed scheme after energy efficiency measures	75.1	15.9	0	0%
Residual Emissions Proposed scheme after energy efficiency measures	75.1	15.9	0	0%
Proposed scheme after on-site renewables	31.9	4.4	11.5	72%
Total CO2 reduction beyond Part L Baseline			11.5	72%

Energy Summary Table - Commercial

IES VE 2023 Commercial Results				
BCS Table 4.1.1 No District Heating Connection	**Regulated Energy Demand (MWh/yr)**	**Regulated CO2 Emissions (tonnes/yr)**	**CO2 saved (tonnes/yr)**	**% CO2 reduction**
Baseline - Part Limiting Values	12.1	1.8		
Proposed scheme after energy efficiency measures	12.1	1.8	0	0%
Residual Emissions Proposed scheme after energy efficiency measures	12.1	1.8	0	0%
Proposed scheme after on-site renewables	11.1	1.4	0.4	22%
Total CO2 reduction beyond Part L Baseline			0.4	22%

Energy Summary Table – Whole Scheme

Whole Scheme BCS14 Results				
BCS Table 4.1.1 No District Heating Connection	**Regulated Energy Demand (MWh/yr)**	**Regulated CO2 Emissions (tonnes/yr)**	**CO2 saved (tonnes/yr)**	**% CO2 reduction**
Baseline – Part L Limiting Values	87.2	17.7		
Proposed scheme after energy efficiency measures	87.2	17.7	0	0%
Residual Emissions Proposed scheme after energy efficiency measures	87.2	17.7	0	0%
Proposed scheme after on-site renewables	42.9	5.8	11.9	67%
Total CO2 reduction beyond Part L Baseline			11.9	67%

Residential Energy Efficiency Table

Notional Building TER without PV (kg/CO2/m2)	Emissions for the proposed building with energy efficiency alone (kg/CO2/m2)
12.9 (average across all flats)	34.8 (average across all flats)

Non-Residential Energy Efficiency Table

TOTAL COMBINED	Baseline building		Proposed building	
	Energy consumption	Fuel Type	Energy consumption	Fuel Type
Heating (MWh/yr)	7.8	Electric	6.8	Electric
Hot water (MWh/yr)	0.4	Electric	0.4	Electric
Cooling (MWh/yr)	0.9	Electric	0.9	Electric
Auxiliary (MWh/yr)	0.0	Electric	0.0	Electric
Lighting (MWh/yr)	3.0	Electric	3.0	Electric
Total (MWh/yr)	12.1		11.1	
Total per GIA (kWh/m2/yr)	37.8		34.6	

On-Site Renewables

The following on-site renewables have been included:

Renewable electricity – total installed capacity (kW)	8.8
Renewable electricity – estimated annual yield (kWh)	5,195
Renewable heat – total installed capacity (kW)	65
Renewable heat –estimated annual yield (kWh)	55,050

3.0 ADAPTATION TO CLIMATE CHANGE (BCS13)

Policy BCS 13:

Development should contribute to both mitigating and adapting to climate change, and to meeting targets to reduce carbon dioxide emissions.

Development should mitigate climate change through measures including:

- *High standards of energy efficiency including optimal levels of thermal insulation, passive ventilation and cooling, passive solar design, and the efficient use of natural resources in new buildings.*
- *The use of decentralised, renewable and low-carbon energy supply systems.*
- *Patterns of development which encourage walking, cycling and the use of public transport instead of journeys by private car.*

Development should adapt to climate change through measures including:

- *Site layouts and approaches to design and construction which provide resilience to climate change.*
- *Measures to conserve water supplies and minimise the risk and impact of flooding.*
- *The use of green infrastructure to minimise and mitigate the heating of the urban environment.*
- *Avoiding responses to climate impacts which lead to increases in energy use and carbon dioxide emissions.*

These measures should be integrated into the design of new development. New development should demonstrate through Sustainability Statements how it would contribute to mitigating and adapting to climate change and to meeting targets to reduce carbon dioxide emissions by means of the above measures.

Climate change means that the occurrence of extreme weather events will become more common. This is likely to include higher summer peak and average temperatures, along with more extreme rainfall: longer periods of drought and more increased storms.

The building design has been developed with a view to being resilient to these extreme conditions in the future.

Passive Ventilation
The building will have a large number of openable windows, to allow natural ventilation.

Decentralised, Renewable and Low-Carbon Energy Supply Systems
The project incorporates renewable heating in the form of heat pumps providing heating and hot water to flats and heating to commercial areas.

The project incorporates renewable energy generation in the form of solar photovoltaic panels.

Provide Resilience to Climate Change
Mechanical cooling is provided to the commercial spaces.

No mechanical cooling is proposed to flats, however heat pumps do have the ability to provide this in future, if required.

4.0 SUSTAINABLE DESIGN AND CONSTRUCTION (BCS15)

Policy BCS15:

Sustainable design and construction will be integral to new development in Bristol. In delivering sustainable design and construction, development should address the following key issues:

- *Maximising energy efficiency and integrating the use of renewable and low-carbon energy;*
- *Waste and recycling during construction and in operation;*
- *Conserving water resources and minimising vulnerability to flooding;*
- *The type, life cycle and source of materials to be used;*
- *Flexibility and adaptability, allowing future modification of use or layout, facilitating future refurbishment and retrofitting;*
- *Opportunities to incorporate measures which enhance the biodiversity value of development, such as green roofs.*

New development will be required to demonstrate as part of the Sustainability Statement submitted with the planning application how the above issues have been addressed. For major development and development for health or education uses, the Sustainability Statement should include a BREEAM and/or Code for Sustainable Homes assessment. Additionally, in the case of a super-major development, a BREEAM for Communities assessment will be required.

From 2016 residential development will be expected to meet Level 6 of the Code for Sustainable Homes. For non-residential development, also from 2016, a BREEAM "Excellent" rating will be expected.

All new development will be required to provide satisfactory arrangements for the storage of refuse and recyclable materials as an integral part of its design. Major developments should include communal facilities for waste collection and recycling where appropriate.

New homes and workplaces should include the provision of high-speed broadband access and enable provision of Next Generation broadband.

The statements on the following page explain how the development aims to mitigate and adapt to climate change, meet targets to reducer carbon dioxide emissions and the other sustainability considerations of BCS15 and beyond.

Note: Code for Sustainable Homes has since been withdrawn. A BREEAM assessment is not proposed for the development.

Energy Strategy
As described above, as far as is possible within the existing building, the development will be designed to reduce energy consumption through improved performance of building fabric through provision of thermal insulation and improved air tightness.

The energy strategy then makes use renewable heat generation via air source heat pumps to deliver low carbon energy efficiently.

Renewable energy will be generated on site through a photovoltaic array.

Materials and Waste
As the building is existing, the majority of the materials whose production, transportation and installation emit carbon dioxide are to be reused, limiting the building's embodied carbon.

For new materials, materials will be selected that have a lower environmental impact and that where feasible preference is made for materials that contain recycled content, reusable materials and reclaimed elements.

Significant waste storage is provided to allow the separation of waste streams for recycling.

Water strategy
The demand for water on the site will be relatively domestic in nature. Use will be limited through the use of low water flow fittings (taps, showers) and dual flush WCs, to meet best practice requirements in line with building regulations. Because of the lack of space for plant required, grey water recycling is not considered suitable.

The energy use of the hot water will be minimised by using heat pumps (flats) or point of use water heaters (commercial areas) to remove losses due to recirculation / trace heating).

Due to its location and size, a flood risk assessment is not proposed, however a drainage strategy plan is to be developed.

Construction Impacts
The contractor will be required to reduce construction waste from the outset through smart planning and smart materials procurement processes.

Flexibility
The commercial areas will be serviced to allow a range of tenants to occupy the spaces with minimal changes required. The servicing strategy avoids routing communal services through individual flats to improve access for maintenance.

Nature (Biodiversity and Green Infrastructure)
The existing locale of the development site is in nature and as such the existing features of ecological value on the site are very limited. A communal amenity space is proposed to one of the flat rear roof areas, which could include planting and opportunities for food growing.

The proposed & retained building structure is not suitable to support a green roof of any depth. However, the development is within 10 minutes' walk of multiple local green spaces.

Broadband Connectivity Assessment
Policy BCS15 states that new homes and workplaces should include the provision of high-speed broadband access and enable provision of Next Generation broadband. This requirement is expanded in the Broadband Connectivity Practice Note to use 'superfast broadband' as the benchmark.

All premises on site will be provided with a Fibre To The Premises (FTTP) broadband connection.

Community Infrastructure and Transport
The proposed development is to be car-free and no parking spaces are to be provided. This will encourage building users to travel by public transport or walk/cycle. Secure bike storage is provided. A travel plan is being developed for the site. The site is well located for local shopping and transport links into the city centre and out of the city to the south.

Social Engagement

The existing buildings are currently vacant and would be brought back into use by the current proposals. The proposals include a scheme of sensitively designed repair, maintenance and conversion works. The re-use of vacant buildings is therefore a key benefit of the proposals alongside the wider public access to the commercial units.

Health and Wellbeing
The buildings will be designed for health and wellbeing in relation to user control over their chosen environment with local controls and guidance provided for flat owners for the control of heating and ventilation systems.

Contaminating finishes will be limited, fresh air and daylight will be provided. Half of the flats proposed are two-aspect, allowing for cross-ventilation in summer.

5.0 APPENDIX – SAP OUTPUT (RESIDENTIAL)

BASELINE

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 01 - 1B1P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	74 C	**DER**	36.28	**TER**	14.69
Environmental	75 C	**% DER < TER**			-146.97
CO_2 Emissions (t/year)	1.63	**DFEE**	94.50	**TFEE**	38.83
Compliance Check	See BREL	**% DFEE < TFEE**			-143.40
% DPER < TPER	-154.25	**DPER**	198.67	**TPER**	78.14

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	48.8800	(1b)	x 3.1000	(2b) =	151.5280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	151.5280	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1320 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6320 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5372 (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	0.6849	0.6715	0.6581	0.5909	0.5775	0.5103	0.5103	0.4969	0.5372	0.5775	0.6043	0.6312	(22b)
Effective ac	0.7346	0.7254	0.7165	0.6746	0.6667	0.6302	0.6302	0.6235	0.6443	0.6667	0.6826	0.6992	(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								
Ext Glazing - Resi New			3.7000	1.5038	5.5639			(27)
Heatloss Floor 1			48.8800	0.2500	12.2200			(28a)
Ext Wall 1	24.0600	3.7000	20.3600	0.3000	6.1080			(29a)
ExtWall 2	13.4800		13.4800	0.3000	4.0440			(29a)
Ext Wall 3: Bin Store	14.8800		14.8800	0.2600	3.8688			(29a)
Total net area of external elements Aum(A, m2)			101.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.5997			(33)
Main dwelling								
Party Wall 1			29.5900	0.5000	14.7950			(32)
Party Ceiling 1			48.8800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	20.2600	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	66.8597	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.7309	36.2755	35.8291	33.7322	33.3399	31.5136	31.5136	31.1754	32.2171	33.3399	34.1335	34.9633	(38)
Heat transfer coeff													

	103.5906	103.1352	102.6888	100.5919	100.1996	98.3733	98.3733	98.0351	99.0768	100.1996	100.9933	101.8230 (39)
Average = Sum(39)m / 12 =												100.5900

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1193	2.1100	2.1008	2.0579	2.0499	2.0125	2.0125	2.0056	2.0269	2.0499	2.0661	2.0831	(40)
HLP (average)												2.0579	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6572 (42)
Hot water usage for mixer showers												
	75.0811	73.9528	72.3086	69.1628	66.8412	64.2522	62.7806	64.4124	66.2011	68.9809	72.1943	74.7935 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	31.6012	30.4520	29.3029	28.1538	27.0046	25.8555	25.8555	27.0046	28.1538	29.3029	30.4520	31.6012 (42c)
Average daily hot water use (litres/day)												97.9506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	106.6823	104.4049	101.6115	97.3165	93.8458	90.1077	88.6361	91.4170	94.3549	98.2838	102.6463	106.3947	(44)
Energy conte	168.9587	148.6711	156.1731	133.2215	126.3345	110.7980	107.1977	113.1934	116.3490	133.3702	146.2385	166.5883	(45)
Energy content (annual)										Total = Sum(45)m =		1627.0941	
Distribution loss (46)m = 0.15 x (45)m													
	25.3438	22.3007	23.4260	19.9832	18.9502	16.6197	16.0797	16.9790	17.4523	20.0055	21.9358	24.9882	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	247.9963	220.0599	235.2107	209.7095	205.3721	156.7100	154.6401	160.6358	162.2610	212.4078	222.7265	245.6259	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	247.9963	220.0599	235.2107	209.7095	205.3721	156.7100	154.6401	160.6358	162.2610	212.4078	222.7265	245.6259	(64)
										Total per year (kWh/year) = Sum(64)m =		2433.3557	(64)
12Total per year (kWh/year)												2433	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	100.0649	89.0722	95.8137	86.7665	85.8923	54.8499	54.2532	56.2467	56.6956	88.2317	91.0947	99.2767	(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	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	84.5371	93.5946	84.5371	87.3550	84.5371	87.3550	84.5371	84.5371	87.3550	84.5371	87.3550	84.5371	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.3254	145.8231	142.0490	134.0146	123.8726	114.3405	107.9725	106.4748	110.2488	118.2833	128.4253	137.9574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	(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)													
	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	(71)
Water heating gains (Table 5)													
	134.4958	132.5479	128.7818	120.5091	115.4467	76.1804	72.9209	75.6004	78.7439	118.5909	126.5204	133.4364	(72)
Total internal gains													
	411.2159	419.8233	403.2256	389.7364	371.7140	325.7336	313.2881	314.4700	324.2054	369.2690	390.1584	403.7886	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	3.7000	11.2829	0.4000	0.9000	0.7700	10.4150	(81)

Solar gains	10.4150	21.2001	38.1958	62.7284	84.3193	89.8933	84.0933	67.0402	46.5421	25.9082	13.1048	8.5054	(83)
Total gains	421.6310	441.0233	441.4214	452.4648	456.0333	415.6269	397.3815	381.5102	370.7476	395.1771	403.2632	412.2940	(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	32.7679	32.9126	33.0557	33.7447	33.8768	34.5057	34.5057	34.6248	34.2607	33.8768	33.6106	33.3367	
alpha	3.1845	3.1942	3.2037	3.2496	3.2585	3.3004	3.3004	3.3083	3.2840	3.2585	3.2407	3.2224	
util living area													
	0.9915	0.9893	0.9856	0.9744	0.9478	0.8963	0.7991	0.8275	0.9338	0.9732	0.9874	0.9922	(86)
MIT	19.0694	19.1899	19.4264	19.8097	20.1995	20.5414	20.7429	20.7145	20.4278	19.9765	19.4876	19.0748	(87)
Th 2	19.9404	19.9450	19.9496	19.9710	19.9750	19.9937	19.9937	19.9972	19.9865	19.9750	19.9669	19.9584	(88)
util rest of house													
	0.9898	0.9871	0.9822	0.9675	0.9304	0.8511	0.6968	0.7368	0.9039	0.9646	0.9843	0.9907	(89)

MIT 2	18.1622	18.2859	18.5252	18.9224	19.3085	19.6491	19.8195	19.8024	19.5410	19.0919	18.5998	18.1814	(90)
Living area fraction									fLA = Living area / (4) =			0.4918	(91)
MIT	18.6084	18.7305	18.9684	19.3588	19.7467	20.0879	20.2737	20.2510	19.9771	19.5269	19.0364	18.6208	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6084	18.7305	18.9684	19.3588	19.7467	20.0879	20.2737	20.2510	19.9771	19.5269	19.0364	18.6208	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9869	0.9836	0.9781	0.9622	0.9256	0.8562	0.7298	0.7639	0.9036	0.9598	0.9807	0.9879	(94)
Useful gains	416.0956	433.8012	431.7705	435.3747	422.1009	355.8759	290.0093	291.4167	334.9972	379.2855	395.4701	407.3222	(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	1482.2162	1426.4089	1280.3667	1052.0716	806.2778	539.8677	361.3896	377.5322	582.2870	894.4740	1205.5008	1468.3680	(97)
Space heating kWh	793.1937	667.0323	631.3555	444.0218	285.8276	0.0000	0.0000	0.0000	0.0000	383.3002	583.2221	789.4181	(98a)
Space heating requirement - total per year (kWh/year)												4577.3714	
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	793.1937	667.0323	631.3555	444.0218	285.8276	0.0000	0.0000	0.0000	0.0000	383.3002	583.2221	789.4181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4577.3714	
Space heating per m2											(98c) / (4) =	93.6451	(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 %)												84.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	793.1937	667.0323	631.3555	444.0218	285.8276	0.0000	0.0000	0.0000	0.0000	383.3002	583.2221	789.4181	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	938.6907	789.3874	747.1663	525.4695	338.2575	0.0000	0.0000	0.0000	0.0000	453.6097	690.2037	934.2226	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	247.9963	220.0599	235.2107	209.7095	205.3721	156.7100	154.6401	160.6358	162.2610	212.4078	222.7265	245.6259	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month	293.4868	260.4260	278.3559	248.1769	243.0440	185.4556	183.0061	190.1015	192.0248	251.3701	263.5817	290.6816	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.6014	13.3183	11.9916	8.7856	6.7862	5.5444	6.1906	8.0468	10.4520	13.7136	15.4895	17.0628	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	5417.0075	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2879.7109	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	133.9831	(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	8516.7015	(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	5417.0075	0.2100	1137.5716	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2879.7109	0.2100	604.7393	(264)
Space and water heating			1742.3109	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.9831	0.1443	19.3379	(268)
Total CO2, kg/year			1773.5780	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			36.2800	(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	5417.0075	1.1300	6121.2185	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2879.7109	1.1300	3254.0733	(278)
Space and water heating			9375.2918	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.9831	1.5338	205.5078	(282)
Total Primary energy kWh/year			9710.9004	(286)
Dwelling Primary energy Rate (DPER)			198.6700	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	48.8800	(1b) x	3.1000	(2b) =	151.5280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		151.5280	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1320	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3820	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3247	(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	0.4140	0.4059	0.3977	0.3572	0.3490	0.3085	0.3085	0.3003	0.3247	0.3490	0.3653	0.3815	(22b)
Effective ac	0.5857	0.5824	0.5791	0.5638	0.5609	0.5476	0.5476	0.5451	0.5527	0.5609	0.5667	0.5728	(25)

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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 Opening Type			3.7000	1.1450	4.2366			(27)
Heatloss Floor 1			48.8800	0.1300	6.3544			(28a)
Ext Wall 1	24.0600	3.7000	20.3600	0.1800	3.6648			(29a)
ExtWall 2	13.4800		13.4800	0.1800	2.4264			(29a)
Ext Wall 3: Bin Store	14.8800		14.8800	0.1800	2.6784			(29a)
Total net area of external elements Aum(A, m2)			101.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.3606			(33)
Main dwelling								
Party Wall 1			29.5900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	5.0650	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	24.4256	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.2870	29.1206	28.9575	28.1915	28.0481	27.3809	27.3809	27.2574	27.6379	28.0481	28.3381	28.6412	(38)
Heat transfer coeff													

	53.7126	53.5462	53.3831	52.6171	52.4738	51.8066	51.8066	51.6830	52.0636	52.4738	52.7637	53.0668 (39)
Average = Sum(39)m / 12 =												52.6164

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0989	1.0955	1.0921	1.0765	1.0735	1.0599	1.0599	1.0573	1.0651	1.0735	1.0795	1.0857	(40)
HLP (average)												1.0764	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6572 (42)
Hot water usage for mixer showers												
	66.7388	65.7358	64.2743	61.4780	59.4144	57.1131	55.8050	57.2554	58.8454	61.3163	64.1727	66.4831 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	31.6012	30.4520	29.3029	28.1538	27.0046	25.8555	25.8555	27.0046	28.1538	29.3029	30.4520	31.6012 (42c)
Average daily hot water use (litres/day)												90.2593 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	98.3400	96.1879	93.5772	89.6318	86.4190	82.9686	81.6605	84.2601	86.9992	90.6192	94.6248	98.0843	(44)
Energy conte	155.7465	136.9703	143.8247	122.7014	116.3366	102.0196	98.7613	104.3316	107.2787	122.9694	134.8103	153.5763	(45)
Energy content (annual)										Total = Sum(45)m =		1499.3268	
Distribution loss (46)m = 0.15 x (45)m													
	23.3620	20.5455	21.5737	18.4052	17.4505	15.3029	14.8142	15.6497	16.0918	18.4454	20.2215	23.0364	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	202.3414	179.0560	190.4196	167.7933	162.9316	147.1114	145.3562	150.9265	152.3705	169.5643	179.9021	200.1712	(62)
WWHRS	-30.5102	-26.9835	-28.2555	-23.3967	-21.8049	-18.6586	-17.4895	-18.5983	-19.3049	-22.7583	-25.7824	-29.9452	(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													
	171.8312	152.0725	162.1641	144.3966	141.1267	128.4528	127.8668	132.3282	133.0656	146.8060	154.1197	170.2260	(64)
										Total per year (kWh/year) = Sum(64)m =		1764.4563	(64)
12Total per year (kWh/year)												1764	(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													
	89.0616	79.2112	85.0976	76.8717	75.9579	69.9950	70.1141	71.9662	71.7436	78.1633	80.8979	88.3400	(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	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	88.7643	98.2748	88.7643	91.7232	88.7643	91.7232	88.7643	88.7643	91.7232	88.7643	91.7232	88.7643	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.3254	145.8231	142.0490	134.0146	123.8726	114.3405	107.9725	106.4748	110.2488	118.2833	128.4253	137.9574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	(71)
Water heating gains (Table 5)													
	119.7065	117.8738	114.3786	106.7663	102.0939	97.2152	94.2393	96.7287	99.6439	105.0581	112.3582	118.7366	(72)
Total internal gains													
	403.6539	412.8294	396.0496	383.3617	365.5885	351.1366	338.8338	339.8256	349.4736	362.9635	383.3644	396.3160	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	3.7000	11.2829	0.6300	0.7000	0.7700	12.7584	(81)

Solar gains	12.7584	25.9701	46.7898	76.8423	103.2911	110.1193	103.0143	82.1242	57.0141	31.7375	16.0534	10.4191	(83)
Total gains	416.4123	438.7994	442.8395	460.2040	468.8796	461.2559	441.8482	421.9498	406.4877	394.7009	399.4177	406.7352	(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	63.1964	63.3928	63.5865	64.5122	64.6884	65.5215	65.5215	65.6781	65.1981	64.6884	64.3329	63.9655	
alpha	5.2131	5.2262	5.2391	5.3008	5.3126	5.3681	5.3681	5.3785	5.3465	5.3126	5.2889	5.2644	
util living area													
	0.9901	0.9854	0.9763	0.9430	0.8579	0.6797	0.5086	0.5519	0.7861	0.9432	0.9813	0.9912	(86)
MIT	19.9270	20.0482	20.2426	20.5495	20.8093	20.9598	20.9928	20.9891	20.9116	20.6142	20.2414	19.9163	(87)
Th 2	20.0018	20.0045	20.0073	20.0201	20.0225	20.0337	20.0337	20.0358	20.0294	20.0225	20.0176	20.0126	(88)
util rest of house													
	0.9871	0.9808	0.9685	0.9233	0.8102	0.5928	0.4008	0.4421	0.7086	0.9197	0.9746	0.9885	(89)

MIT 2	18.7736	18.9290	19.1763	19.5632	19.8604	20.0106	20.0314	20.0320	19.9704	19.6474	19.1843	18.7680	(90)
Living area fraction										fLA = Living area / (4) =		0.4918	(91)
MIT	19.3409	19.4794	19.7007	20.0483	20.3271	20.4774	20.5043	20.5027	20.4333	20.1229	19.7042	19.3328	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3409	19.4794	19.7007	20.0483	20.3271	20.4774	20.5043	20.5027	20.4333	20.1229	19.7042	19.3328	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9778	0.9655	0.9240	0.8264	0.6341	0.4540	0.4963	0.7431	0.9225	0.9719	0.9861	(94)
Useful gains	409.9328	429.0665	427.5671	425.2254	387.5006	292.5035	200.6018	209.4026	302.0643	364.1134	388.2046	401.0659	(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	807.8847	780.6735	704.6973	586.5896	452.6949	304.4881	202.2670	212.0406	329.7335	499.7025	665.0452	803.0474	(97)
Space heating kWh	296.0762	236.2799	206.1849	116.1822	48.5045	0.0000	0.0000	0.0000	0.0000	100.8783	199.3252	299.0743	(98a)
Space heating requirement - total per year (kWh/year)												1502.5056	
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	296.0762	236.2799	206.1849	116.1822	48.5045	0.0000	0.0000	0.0000	0.0000	100.8783	199.3252	299.0743	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1502.5056	
Space heating per m2											(98c) / (4) =	30.7387	(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	296.0762	236.2799	206.1849	116.1822	48.5045	0.0000	0.0000	0.0000	0.0000	100.8783	199.3252	299.0743	(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)	320.7759	255.9913	223.3856	125.8745	52.5510	0.0000	0.0000	0.0000	0.0000	109.2940	215.9537	324.0241	(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	171.8312	152.0725	162.1641	144.3966	141.1267	128.4528	127.8668	132.3282	133.0656	146.8060	154.1197	170.2260	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2684	85.0441	84.5995	83.5767	81.9238	79.8000	79.8000	79.8000	79.8000	83.2359	84.6376	85.3101	(217)
Fuel for water heating, kWh/month	201.5180	178.8160	191.6845	172.7713	172.2658	160.9684	160.2341	165.8248	166.7489	176.3734	182.0936	199.5379	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.4435	14.7960	13.3222	9.7604	7.5392	6.1596	6.8775	8.9397	11.6118	15.2352	17.2082	18.9561	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.8943	-24.7193	-36.8603	-43.0542	-47.8464	-45.2111	-44.7086	-41.5441	-36.1393	-29.0386	-18.9098	-14.5063	(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	-6.9624	-14.8906	-30.0465	-45.7775	-61.1454	-61.6297	-60.8541	-51.1939	-37.1250	-21.4492	-9.3487	-5.4836	(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	1627.8500	(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	2128.8368	(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)	148.8494	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-805.3388	(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	3186.1974	(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	1627.8500	0.2100	341.8485	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	2128.8368	0.2100	447.0557	(264)
Space and water heating			788.9042	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	148.8494	0.1443	21.4836	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-399.4323	0.1338	-53.4400	
PV Unit electricity exported	-405.9066	0.1255	-50.9400	
Total			-104.3800	(269)
Total CO2, kg/year			717.9371	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1627.8500	1.1300	1839.4706	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2128.8368	1.1300	2405.5856	(278)
Space and water heating			4245.0561	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	148.8494	1.5338	228.3102	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-399.4323	1.4944	-596.9195	
PV Unit electricity exported	-405.9066	0.4606	-186.9777	
Total			-783.8972	(283)
Total Primary energy kWh/year			3819.5700	(286)
Target Primary Energy Rate (TPER)			78.1400	(287)

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Property Reference	Flat 02 - 2B3P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	73 C	**DER**	34.99	**TER**	12.91
Environmental	73 C	**% DER < TER**			-171.03
CO_2 Emissions (t/year)	1.94	**DFEE**	94.38	**TFEE**	35.43
Compliance Check	See BREL	**% DFEE < TFEE**			-166.38
% DPER < TPER	-180.29	**DPER**	191.21	**TPER**	68.22

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.3000 (1b)	x	3.1000 (2b)	=	190.0300	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.0300	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1052	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6052	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4691	(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	0.5981	0.5863	0.5746	0.5160	0.5042	0.4456	0.4456	0.4339	0.4691	0.5042	0.5277	0.5512	(22b)
Effective ac	0.6788	0.6719	0.6651	0.6331	0.6271	0.5993	0.5993	0.5941	0.6100	0.6271	0.6392	0.6519	(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								
Ext Glazing - Resi New			7.1500	1.5038	10.7519			(27)
Heatloss Floor 1			61.3000	0.2500	15.3250			(28a)
Ext Wall 1	26.7500	3.8300	22.9200	0.2600	5.9592			(29a)
Ext Wall 2	13.7600	3.3200	10.4400	0.3000	3.1320			(29a)
Extl Wall 3: Bin Store	4.9300		4.9300	0.2600	1.2818			(29a)
Ext Wall 4: Bin Store	9.5200		9.5200	0.3000	2.8560			(29a)
Total net area of external elements Aum(A, m2)			116.2600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.1759			(33)
Main dwelling								
Party Wall 1			55.7400	0.5000	27.8700			(32)
Party Ceiling 1			61.3000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	23.2520	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	90.4279	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.5698	42.1343	41.7075	39.7025	39.3274	37.5811	37.5811	37.2577	38.2538	39.3274	40.0863	40.8796	(38)

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Heat transfer coeff
132.9977 132.5622 132.1354 130.1304 129.7553 128.0090 128.0090 127.6856 128.6816 129.7553 130.5141 131.3075 (39)
Average = Sum(39)m / 12 = 130.1286

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1696	2.1625	2.1556	2.1228	2.1167	2.0882	2.0882	2.0830	2.0992	2.1167	2.1291	2.1420	(40)
HLP (average)												2.1228	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0181 (42)
Hot water usage for mixer showers
83.8569 82.5967 80.7603 77.2468 74.6538 71.7622 70.1187 71.9411 73.9389 77.0436 80.6326 83.5356 (42a)
Hot water usage for baths
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42b)
Hot water usage for other uses
35.2978 34.0142 32.7307 31.4471 30.1636 28.8800 28.8800 30.1636 31.4471 32.7307 34.0142 35.2978 (42c)
Average daily hot water use (litres/day) 109.4021 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	119.1547	116.6109	113.4910	108.6939	104.8174	100.6423	98.9987	102.1047	105.3860	109.7743	114.6469	118.8334	(44)
Energy conte	188.7119	166.0524	174.4314	148.7965	141.1044	123.7514	119.7303	126.4269	129.9515	148.9627	163.3355	186.0644	(45)
Energy content (annual)										Total = Sum(45)m =		1817.3193	

Distribution loss (46)m = 0.15 x (45)m
28.3068 24.9079 26.1647 22.3195 21.1657 18.5627 17.9595 18.9640 19.4927 22.3444 24.5003 27.9097 (46)
Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 0.7800 (55)
Total storage loss
24.1800 21.8400 24.1800 23.4000 24.1800 23.4000 24.1800 24.1800 23.4000 24.1800 23.4000 24.1800 (56)
If cylinder contains dedicated solar storage
24.1800 21.8400 24.1800 23.4000 24.1800 23.4000 24.1800 24.1800 23.4000 24.1800 23.4000 24.1800 (57)
Primary loss 54.8576 49.5488 54.8576 53.0880 54.8576 22.5120 23.2624 23.2624 22.5120 54.8576 53.0880 54.8576 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
267.7495 237.4412 253.4690 225.2845 220.1420 169.6634 167.1727 173.8693 175.8635 228.0003 239.8235 265.1020 (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
267.7495 237.4412 253.4690 225.2845 220.1420 169.6634 167.1727 173.8693 175.8635 228.0003 239.8235 265.1020 (64)
Total per year (kWh/year) = Sum(64)m = 2623.5809 (64)
12Total per year (kWh/year) 2624 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
106.6328 94.8515 101.8845 91.9452 90.8033 59.1569 58.4203 60.6469 61.2185 93.4162 96.7794 105.7525 (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	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	93.9586	104.0256	93.9586	97.0906	93.9586	97.0906	93.9586	93.9586	97.0906	93.9586	97.0906	93.9586	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	176.2133	178.0418	173.4339	163.6243	151.2415	139.6033	131.8283	129.9998	134.6076	144.4172	156.8001	168.4383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	(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)													
	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	(71)
Water heating gains (Table 5)													
	143.3236	141.1480	136.9416	127.7017	122.0474	82.1624	78.5218	81.5146	85.0257	125.5594	134.4159	142.1404	(72)
Total internal gains													
	466.7677	476.4876	457.6063	441.6888	420.5197	372.1284	357.5809	358.7452	369.9960	417.2074	441.5787	457.8095	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.8300	11.2829	0.4000	0.9000	0.7700	10.7809	(75)
Southeast	3.3200	36.7938	0.4000	0.9000	0.7700	30.4754	(77)

Solar gains	41.2563	73.8557	110.5644	152.9378	185.8553	190.9123	181.3960	155.8595	125.0842	84.1909	50.0677	34.8848	(83)
Total gains	508.0240	550.3433	568.1707	594.6266	606.3750	563.0408	538.9770	514.6047	495.0802	501.3983	491.6464	492.6943	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.0077	32.1128	32.2165	32.7129	32.8075	33.2550	33.2550	33.3393	33.0812	32.8075	32.6167	32.4197	
alpha	3.1338	3.1409	3.1478	3.1809	3.1872	3.2170	3.2170	3.2226	3.2054	3.1872	3.1744	3.1613	
util living area													
	0.9924	0.9894	0.9846	0.9714	0.9412	0.8822	0.7794	0.8110	0.9256	0.9728	0.9884	0.9932	(86)
MIT	19.0028	19.1418	19.3986	19.7926	20.1943	20.5431	20.7440	20.7140	20.4236	19.9426	19.4248	18.9959	(87)
Th 2	19.9152	19.9187	19.9222	19.9386	19.9416	19.9559	19.9559	19.9585	19.9504	19.9416	19.9354	19.9290	(88)

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util rest of house													
	0.9908	0.9872	0.9809	0.9636	0.9217	0.8318	0.6704	0.7137	0.8922	0.9639	0.9855	0.9918	(89)
MIT 2	18.0767	18.2179	18.4764	18.8799	19.2759	19.6170	19.7838	19.7654	19.5065	19.0324	18.5133	18.0803	(90)
Living area fraction										fLA = Living area / (4) =		0.3946	(91)
MIT	18.4422	18.5825	18.8403	19.2401	19.6383	19.9824	20.1628	20.1397	19.8684	19.3916	18.8730	18.4416	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4422	18.5825	18.8403	19.2401	19.6383	19.9824	20.1628	20.1397	19.8684	19.3916	18.8730	18.4416	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9834	0.9761	0.9570	0.9147	0.8334	0.6957	0.7339	0.8888	0.9578	0.9816	0.9891	(94)
Useful gains	501.8640	541.2249	554.5973	569.0789	554.6724	469.2407	374.9875	377.6617	440.0461	480.2629	482.5907	487.3214	(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													
	1880.8763	1813.7788	1630.5897	1345.5602	1030.0368	688.9998	456.0647	477.5117	742.2910	1140.7529	1536.5415	1870.0296	(97)
Space heating kWh													
	1025.9852	855.1562	800.5384	559.0665	353.6711	0.0000	0.0000	0.0000	0.0000	491.4046	758.8446	1028.7349	(98a)
Space heating requirement - total per year (kWh/year)												5873.4014	
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													
	1025.9852	855.1562	800.5384	559.0665	353.6711	0.0000	0.0000	0.0000	0.0000	491.4046	758.8446	1028.7349	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5873.4014	
Space heating per m2											(98c) / (4) =	95.8141	(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 %)	84.5000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1025.9852	855.1562	800.5384	559.0665	353.6711	0.0000	0.0000	0.0000	0.0000	491.4046	758.8446	1028.7349	(98)
Space heating efficiency (main heating system 1)													
	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)													
	1214.1836	1012.0192	947.3827	661.6172	418.5457	0.0000	0.0000	0.0000	0.0000	581.5439	898.0410	1217.4377	(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													
	267.7495	237.4412	253.4690	225.2845	220.1420	169.6634	167.1727	173.8693	175.8635	228.0003	239.8235	265.1020	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month													
	316.8633	280.9955	299.9634	266.6089	260.5231	200.7851	197.8375	205.7625	208.1225	269.8228	283.8148	313.7302	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.4517	14.8026	13.3281	9.7647	7.5426	6.1623	6.8806	8.9436	11.6169	15.2420	17.2158	18.9645	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	6950.7709 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	3104.8295 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	148.9154 (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	10290.5157 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6950.7709	0.2100	1459.6619	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3104.8295	0.2100	652.0142	(264)
Space and water heating			2111.6761	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	148.9154	0.1443	21.4931	(268)
Total CO2, kg/year			2145.0984	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			34.9900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	6950.7709	1.1300	7854.3711	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3104.8295	1.1300	3508.4573	(278)
Space and water heating			11362.8284	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	148.9154	1.5338	228.4114	(282)
Total Primary energy kWh/year			11721.3406	(286)
Dwelling Primary energy Rate (DPER)			191.2100	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.3000	(1b) x	3.1000	(2b) =	190.0300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.0300	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1052	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3552	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2753	(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	0.3510	0.3441	0.3373	0.3028	0.2960	0.2616	0.2616	0.2547	0.2753	0.2960	0.3097	0.3235	(22b)
Effective ac	0.5616	0.5592	0.5569	0.5459	0.5438	0.5342	0.5342	0.5324	0.5379	0.5438	0.5480	0.5523	(25)

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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 Opening Type			7.1500	1.1450	8.1870			(27)
Heatloss Floor 1			61.3000	0.1300	7.9690			(28a)
Ext Wall 1	26.7500	3.8300	22.9200	0.1800	4.1256			(29a)
Ext Wall 2	13.7600	3.3200	10.4400	0.1800	1.8792			(29a)
Extl Wall 3: Bin Store	4.9300		4.9300	0.1800	0.8874			(29a)
Ext Wall 4: Bin Store	9.5200		9.5200	0.1800	1.7136			(29a)
Total net area of external elements Aum(A, m2)			116.2600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.7618			(33)
Main dwelling								
Party Wall 1			55.7400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)		5.8130	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	30.5748	(37)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.2185	35.0685	34.9214	34.2307	34.1015	33.4999	33.4999	33.3885	33.7316	34.1015	34.3629	34.6362	(38)
Heat transfer coeff													
	65.7933	65.6433	65.4963	64.8055	64.6763	64.0747	64.0747	63.9633	64.3064	64.6763	64.9377	65.2111	(39)
Average = Sum(39)m / 12 =												64.8049	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0733	1.0709	1.0685	1.0572	1.0551	1.0453	1.0453	1.0434	1.0490	1.0551	1.0593	1.0638	(40)
HLP (average)												1.0572	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0181	(42)
Hot water usage for mixer showers													
	74.5395	73.4193	71.7869	68.6638	66.3590	63.7887	62.3277	63.9477	65.7235	68.4832	71.6734	74.2539	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	35.2978	34.0142	32.7307	31.4471	30.1636	28.8800	28.8800	30.1636	31.4471	32.7307	34.0142	35.2978	(42c)
Average daily hot water use (litres/day)												100.8118	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.8373	107.4335	104.5176	100.1109	96.5225	92.6687	91.2077	94.1112	97.1706	101.2139	105.6877	109.5517	(44)
Energy conte	173.9554	152.9839	160.6397	137.0468	129.9379	113.9470	110.3078	116.5294	119.8211	137.3463	150.5715	171.5314	(45)
Energy content (annual)										Total = Sum(45)m =		1674.6181	
Distribution loss (46)m = 0.15 x (45)m													
	26.0933	22.9476	24.0960	20.5570	19.4907	17.0920	16.5462	17.4794	17.9732	20.6019	22.5857	25.7297	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)
Total storage loss													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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													
	224.8814	198.9816	211.5658	186.3301	180.8640	163.2302	161.2339	167.4554	169.1043	188.2723	199.8548	222.4575	(62)
WWHRS	-34.0763	-30.1374	-31.5581	-26.1314	-24.3535	-20.8395	-19.5337	-20.7721	-21.5613	-25.4184	-28.7960	-33.4453	(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													
	190.8051	168.8443	180.0076	160.1988	156.5105	142.3908	141.7002	146.6833	147.5430	162.8539	171.0588	189.0122	(64)
										Total per year (kWh/year) = Sum(64)m =		1957.6085	(64)
12Total per year (kWh/year)												1958	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	98.5810	87.6653	94.1536	84.9947	83.9452	77.3140	77.4182	79.4869	79.2671	86.4085	89.4917	97.7751	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	99.2741	109.9106	99.2741	102.5832	99.2741	102.5832	99.2741	99.2741	102.5832	99.2741	102.5832	99.2741	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	176.2133	178.0418	173.4339	163.6243	151.2415	139.6033	131.8283	129.9998	134.6076	144.4172	156.8001	168.4383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	(71)
Water heating gains (Table 5)													
	132.5014	130.4544	126.5505	118.0482	112.8296	107.3806	104.0567	106.8372	110.0932	116.1404	124.2940	131.4181	(72)
Total internal gains													
	464.2608	474.6789	455.5306	440.5279	419.6172	402.8392	388.4312	389.3832	400.5562	416.1039	439.9494	455.4025	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.8300	11.2829	0.6300	0.7000	0.7700	13.2067	(75)
Southeast	3.3200	36.7938	0.6300	0.7000	0.7700	37.3323	(77)

Solar gains	50.5390	90.4733	135.4414	187.3488	227.6727	233.8676	222.2101	190.9279	153.2282	103.1339	61.3329	42.7339	(83)
Total gains	514.7998	565.1521	590.9720	627.8767	647.2900	636.7068	610.6414	580.3111	553.7844	519.2378	501.2823	498.1364	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.7017	64.8496	64.9952	65.6880	65.8192	66.4372	66.4372	66.5529	66.1978	65.8192	65.5542	65.2795	
alpha	5.3134	5.3233	5.3330	5.3792	5.3879	5.4291	5.4291	5.4369	5.4132	5.3879	5.3703	5.3520	
util living area													
	0.9905	0.9831	0.9683	0.9204	0.8109	0.6217	0.4579	0.5007	0.7380	0.9301	0.9807	0.9919	(86)

MIT	19.9557	20.1106	20.3300	20.6332	20.8637	20.9746	20.9959	20.9935	20.9376	20.6624	20.2691	19.9315	(87)
Th 2	20.0227	20.0247	20.0267	20.0360	20.0377	20.0458	20.0458	20.0473	20.0427	20.0377	20.0342	20.0305	(88)
util rest of house													
	0.9875	0.9779	0.9584	0.8956	0.7576	0.5384	0.3606	0.4003	0.6584	0.9030	0.9738	0.9894	(89)
MIT 2	18.8255	19.0226	19.2988	19.6722	19.9261	20.0317	20.0445	20.0450	20.0026	19.7145	19.2316	18.8007	(90)
Living area fraction										fLA = Living area / (4) =		0.3946	(91)
MIT	19.2715	19.4519	19.7057	20.0514	20.2961	20.4038	20.4199	20.4193	20.3716	20.0886	19.6410	19.2469	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2715	19.4519	19.7057	20.0514	20.2961	20.4038	20.4199	20.4193	20.3716	20.0886	19.6410	19.2469	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9846	0.9741	0.9544	0.8960	0.7730	0.5705	0.3991	0.4401	0.6873	0.9047	0.9703	0.9867	(94)
Useful gains	506.8491	550.5034	564.0005	562.6006	500.3464	363.2588	243.7334	255.3664	380.6431	469.7443	486.3761	491.5329	(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													
	985.0236	955.2356	864.9245	722.6738	555.9641	371.8769	244.7612	257.0878	403.3020	613.6872	814.3848	981.2252	(97)
Space heating kWh													
	355.7618	271.9800	223.8874	115.2527	41.3796	0.0000	0.0000	0.0000	0.0000	107.0935	236.1662	364.3311	(98a)
Space heating requirement - total per year (kWh/year)												1715.8523	
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													
	355.7618	271.9800	223.8874	115.2527	41.3796	0.0000	0.0000	0.0000	0.0000	107.0935	236.1662	364.3311	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1715.8523	
Space heating per m2											(98c) / (4) =	27.9911	(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													
	355.7618	271.9800	223.8874	115.2527	41.3796	0.0000	0.0000	0.0000	0.0000	107.0935	236.1662	364.3311	(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)													
	385.4408	294.6696	242.5649	124.8675	44.8316	0.0000	0.0000	0.0000	0.0000	116.0276	255.8680	394.7249	(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													
	190.8051	168.8443	180.0076	160.1988	156.5105	142.3908	141.7002	146.6833	147.5430	162.8539	171.0588	189.0122	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4362	85.1229	84.5501	83.3339	81.5278	79.8000	79.8000	79.8000	79.8000	83.1430	84.7834	85.5059	(217)
Fuel for water heating, kWh/month													
	223.3305	198.3535	212.9005	192.2371	191.9719	178.4346	177.5692	183.8137	184.8910	195.8720	201.7598	221.0516	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.6272	16.5479	14.8995	10.9160	8.4319	6.8889	7.6918	9.9981	12.9866	17.0391	19.2456	21.2005	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.9914	-30.6162	-45.5094	-52.9769	-58.7033	-55.3851	-54.7352	-50.9172	-44.4094	-35.8464	-23.4489	-18.0329	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9270	-19.0582	-38.3978	-58.4262	-77.9823	-78.6030	-77.6500	-65.3848	-47.4708	-27.4699	-11.9898	-7.0364	(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	1858.9949 (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	2362.1854 (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)	166.4732 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1009.9687 (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	3463.6848 (238)

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

Full SAP Calculation Printout

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1858.9949	0.2100	390.3889	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2362.1854	0.2100	496.0589	(264)
Space and water heating			886.4479	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.4732	0.1443	24.0272	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-491.5724	0.1339	-65.8054	
PV Unit electricity exported	-518.3963	0.1255	-65.0709	
Total			-130.8763	(269)
Total CO2, kg/year			791.5280	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.9100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1858.9949	1.1300	2100.6642	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2362.1854	1.1300	2669.2695	(278)
Space and water heating			4769.9337	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	166.4732	1.5338	255.3422	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-491.5724	1.4947	-734.7581	
PV Unit electricity exported	-518.3963	0.4607	-238.8460	
Total			-973.6041	(283)
Total Primary energy kWh/year			4181.7725	(286)
Target Primary Energy Rate (TPER)			68.2200	(287)

BASELINE

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 03 - 1B1P			**Issued on Date**	20/08/2025
Assessment Reference	00001		**Prop Type Ref**		
Property	Wells Road				

SAP Rating	76 C	**DER**	33.49	**TER**	11.45
Environmental	79 C	**% DER < TER**			-192.49
CO_2 Emissions (t/year)	1.29	**DFEE**	80.15	**TFEE**	19.41
Compliance Check	See BREL	**% DFEE < TFEE**			-312.95
% DPER < TPER	-202.70	**DPER**	183.71	**TPER**	60.69

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	42.3800	(1b)	x 3.1000	(2b) =	131.3780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.3800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	131.3780	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1522 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6522 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5055 (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	0.6445	0.6319	0.6192	0.5560	0.5434	0.4802	0.4802	0.4676	0.5055	0.5434	0.5687	0.5939	(22b)
Effective ac	0.7077	0.6996	0.6917	0.6546	0.6476	0.6153	0.6153	0.6093	0.6278	0.6476	0.6617	0.6764	(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								
Ext Glazing - Resi New			5.0600	1.5038	7.6090			(27)
Ext Wall 1	15.8100	3.8300	11.9800	0.3000	3.5940			(29a)
Ext Wall 2	8.3100	1.2300	7.0800	0.3000	2.1240			(29a)
Total net area of external elements Aum(A, m2)			24.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.8670			(33)
Main dwelling								
Party Wall 1			67.0800	0.5000	33.5400			(32)
Party Floor 1			42.3800					(32d)
Party Ceiling 1			42.3800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		4.8240 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	51.6910 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.6814	30.3317	29.9890	28.3793	28.0781	26.6761	26.6761	26.4165	27.2162	28.0781	28.6874	29.3244	(38)
Heat transfer coeff	82.3724	82.0228	81.6800	80.0703	79.7692	78.3672	78.3672	78.1075	78.9072	79.7692	80.3784	81.0154	(39)

Average = Sum(39)m / 12 = 80.0689

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9437	1.9354	1.9273	1.8893	1.8822	1.8492	1.8492	1.8430	1.8619	1.8822	1.8966	1.9116	(40)
HLP (average)												1.8893	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4709 (42)

Hot water usage for mixer showers

70.5530	69.4928	67.9477	64.9916	62.8101	60.3772	58.9944	60.5277	62.2085	64.8207	67.8403	70.2827	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

29.6938	28.6140	27.5343	26.4545	25.3747	24.2949	24.2949	25.3747	26.4545	27.5343	28.6140	29.6938	(42c)

Average daily hot water use (litres/day) 92.0419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.2469	98.1068	95.4820	91.4461	88.1848	84.6721	83.2893	85.9024	88.6630	92.3549	96.4543	99.9765	(44)
Energy conte	158.7665	139.7028	146.7523	125.1851	118.7136	104.1143	100.7312	106.3651	109.3304	125.3248	137.4169	156.5391	(45)
Energy content (annual)											Total = Sum(45)m =	1528.9422	
Distribution loss (46)m = 0.15 x (45)m	23.8150	20.9554	22.0128	18.7778	17.8070	15.6171	15.1097	15.9548	16.3996	18.7987	20.6125	23.4809	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	237.8041	211.0916	225.7899	201.6731	197.7512	150.0263	148.1736	153.8075	155.2424	204.3624	213.9049	235.5767	(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	237.8041	211.0916	225.7899	201.6731	197.7512	150.0263	148.1736	153.8075	155.2424	204.3624	213.9049	235.5767	(64)
										Total per year (kWh/year) = Sum(64)m =		2335.2038	(64)
12Total per year (kWh/year)												2335	(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	96.6759	86.0902	92.6812	84.0945	83.3584	52.6276	52.1030	53.9763	54.3619	85.5566	88.1615	95.9353	(65)

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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	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.6883	74.9406	67.6883	69.9445	67.6883	69.9445	67.6883	67.6883	69.9445	67.6883	69.9445	67.6883	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	127.5623	128.8860	125.5503	118.4491	109.4850	101.0600	95.4317	94.1080	97.4436	104.5449	113.5089	121.9339	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	(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)	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	(71)
Water heating gains (Table 5)	129.9408	128.1104	124.5715	116.7979	112.0408	73.0939	70.0310	72.5488	75.5027	114.9954	122.4466	128.9453	(72)
Total internal gains	370.2553	377.0010	362.8741	350.2554	334.2780	289.1624	278.2149	279.4090	287.9548	332.2925	350.9640	363.6315	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2300	11.2829	0.4000	0.9000	0.7700	3.4623	(75)
Southwest	3.8300	36.7938	0.4000	0.9000	0.7700	35.1568	(79)

Solar gains	38.6191	66.9327	94.6349	122.3773	141.7462	142.7769	136.7966	122.0323	104.1929	74.7985	46.4662	32.9144	(83)
Total gains	408.8744	443.9336	457.5089	472.6327	476.0243	431.9393	415.0115	401.4413	392.1478	407.0910	397.4302	396.5459	(84)

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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	35.7287	35.8810	36.0315	36.7559	36.8947	37.5547	37.5547	37.6795	37.2977	36.8947	36.6150	36.3271	
alpha	3.3819	3.3921	3.4021	3.4504	3.4596	3.5036	3.5036	3.5120	3.4865	3.4596	3.4410	3.4218	
util living area	0.9883	0.9834	0.9755	0.9551	0.9104	0.8321	0.7011	0.7334	0.8844	0.9547	0.9814	0.9895	(86)
MIT	19.2987	19.4421	19.6830	20.0457	20.3946	20.6729	20.8215	20.8030	20.5797	20.1729	19.6961	19.2963	(87)
Th 2	20.0282	20.0323	20.0363	20.0553	20.0589	20.0754	20.0754	20.0785	20.0691	20.0589	20.0517	20.0442	(88)
util rest of house	0.9861	0.9801	0.9703	0.9444	0.8853	0.7754	0.5956	0.6350	0.8423	0.9418	0.9772	0.9875	(89)

MIT 2	18.4580	18.6037	18.8462	19.2189	19.5592	19.8290	19.9451	19.9362	19.7444	19.3487	18.8723	18.4681	(90)
Living area fraction										fLA = Living area / (4) =		0.4403	(91)
MIT	18.8282	18.9729	19.2146	19.5829	19.9271	20.2006	20.3310	20.3178	20.1122	19.7116	19.2350	18.8328	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8282	18.9729	19.2146	19.5829	19.9271	20.2006	20.3310	20.3178	20.1122	19.7116	19.2350	18.8328	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9824	0.9756	0.9646	0.9378	0.8812	0.7841	0.6276	0.6634	0.8446	0.9360	0.9725	0.9842	(94)
Useful gains	401.6857	433.0854	441.3325	443.2241	419.4684	338.6994	260.4691	266.3035	331.2085	381.0193	386.5056	390.2730	(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	1196.7220	1154.2967	1038.5313	855.3866	656.2650	438.9027	292.3869	306.0134	474.4075	726.8245	975.3918	1185.4785	(97)
Space heating kWh	591.5070	484.6540	444.3159	296.7571	176.1767	0.0000	0.0000	0.0000	0.0000	257.2791	423.9980	591.6329	(98a)
Space heating requirement - total per year (kWh/year)												3266.3206	
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	591.5070	484.6540	444.3159	296.7571	176.1767	0.0000	0.0000	0.0000	0.0000	257.2791	423.9980	591.6329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3266.3206	
Space heating per m2											(98c) / (4) =	77.0722	(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 %)												84.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	591.5070	484.6540	444.3159	296.7571	176.1767	0.0000	0.0000	0.0000	0.0000	257.2791	423.9980	591.6329	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	700.0083	573.5550	525.8176	351.1918	208.4931	0.0000	0.0000	0.0000	0.0000	304.4723	501.7728	700.1573	(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	237.8041	211.0916	225.7899	201.6731	197.7512	150.0263	148.1736	153.8075	155.2424	204.3624	213.9049	235.5767	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month	281.4250	249.8125	267.2070	238.6664	234.0251	177.5459	175.3534	182.0208	183.7188	241.8490	253.1419	278.7890	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.2927	10.6639	9.6016	7.0346	5.4337	4.4394	4.9568	6.4430	8.3689	10.9804	12.4024	13.6621	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3865.4682	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2763.5548	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	107.2794	(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	6822.3023	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year

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Space heating - main system 1	3865.4682	0.2100	811.7483	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2763.5548	0.2100	580.3465	(264)
Space and water heating			1392.0948	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	107.2794	0.1443	15.4837	(268)
Total CO2, kg/year			1419.5078	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			33.4900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3865.4682	1.1300	4367.9790	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2763.5548	1.1300	3122.8169	(278)
Space and water heating			7490.7959	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	107.2794	1.5338	164.5487	(282)
Total Primary energy kWh/year			7785.4454	(286)
Dwelling Primary energy Rate (DPER)			183.7100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	42.3800	(1b) x	3.1000	(2b) =	131.3780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.3800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.3780	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1522	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4022	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3117	(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	0.3975	0.3897	0.3819	0.3429	0.3351	0.2961	0.2961	0.2884	0.3117	0.3351	0.3507	0.3663	(22b)
Effective ac	0.5790	0.5759	0.5729	0.5588	0.5561	0.5439	0.5439	0.5416	0.5486	0.5561	0.5615	0.5671	(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 Opening Type			5.0600	1.1450	5.7939			(27)
Ext Wall 1	15.8100	3.8300	11.9800	0.1800	2.1564			(29a)
Ext Wall 2	8.3100	1.2300	7.0800	0.1800	1.2744			(29a)
Total net area of external elements Aum(A, m2)			24.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2247			(33)
Main dwelling								
Party Wall 1			67.0800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	1.2060	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	10.4307	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.1018	24.9688	24.8385	24.2263	24.1117	23.5785	23.5785	23.4798	23.7839	24.1117	24.3434	24.5857	(38)
Heat transfer coeff	35.5325	35.3995	35.2692	34.6569	34.5424	34.0092	34.0092	33.9104	34.2146	34.5424	34.7741	35.0164	(39)
Average = Sum(39)m / 12 =												34.6564	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8384	0.8353	0.8322	0.8178	0.8151	0.8025	0.8025	0.8002	0.8073	0.8151	0.8205	0.8262	(40)
HLP (average)												0.8178	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4709 (42)
Hot water usage for mixer showers												
	62.7138	61.7714	60.3980	57.7703	55.8312	53.6686	52.4394	53.8024	55.2965	57.6184	60.3025	62.4735 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	29.6938	28.6140	27.5343	26.4545	25.3747	24.2949	24.2949	25.3747	26.4545	27.5343	28.6140	29.6938 (42c)
Average daily hot water use (litres/day)												84.8144 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	92.4076	90.3854	87.9323	84.2248	81.2059	77.9636	76.7344	79.1771	81.7510	85.1526	88.9165	92.1673	(44)
Energy conte	146.3511	128.7076	135.1486	115.2996	109.3187	95.8653	92.8036	98.0378	100.8071	115.5513	126.6779	144.3118	(45)
Energy content (annual)										Total = Sum(45)m =		1408.8804	
Distribution loss (46)m = 0.15 x (45)m													
	21.9527	19.3061	20.2723	17.2949	16.3978	14.3798	13.9205	14.7057	15.1211	17.3327	19.0017	21.6468	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	192.9460	170.7933	181.7435	160.3914	155.9136	140.9571	139.3985	144.6327	145.8990	162.1462	171.7697	190.9067	(62)
WWHRS	-28.6701	-25.3561	-26.5515	-21.9857	-20.4898	-17.5333	-16.4347	-17.4766	-18.1406	-21.3858	-24.2275	-28.1392	(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													
	164.2759	145.4372	155.1921	138.4057	135.4238	123.4238	122.9638	127.1561	127.7583	140.7604	147.5422	162.7675	(64)
										Total per year (kWh/year) = Sum(64)m =		1691.1069	(64)
12Total per year (kWh/year)												1691	(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													
	85.9377	76.4638	82.2128	74.4106	73.6244	67.9487	68.1331	69.8735	69.5918	75.6967	78.1939	85.2596	(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	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	71.4955	79.1557	71.4955	73.8787	71.4955	73.8787	71.4955	71.4955	73.8787	71.4955	73.8787	71.4955	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	127.5623	128.8860	125.5503	118.4491	109.4850	101.0600	95.4317	94.1080	97.4436	104.5449	113.5089	121.9339	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	(71)
Water heating gains (Table 5)													
	115.5076	113.7855	110.5011	103.3480	98.9575	94.3732	91.5768	93.9160	96.6553	101.7429	108.6026	114.5962	(72)
Total internal gains													
	362.6294	369.8912	355.6109	343.7397	328.0020	314.3759	303.5679	304.5834	313.0416	325.8473	344.0542	356.0896	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2300	11.2829	0.6300	0.7000	0.7700	4.2413	(75)
Southwest	3.8300	36.7938	0.6300	0.7000	0.7700	43.0671	(79)

Solar gains	47.3084	81.9925	115.9277	149.9122	173.6391	174.9016	167.5759	149.4896	127.6364	91.6281	56.9211	40.3201 (83)
Total gains	409.9378	451.8837	471.5386	493.6519	501.6411	489.2775	471.1438	454.0730	440.6780	417.4754	400.9753	396.4097 (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	82.8272	83.1384	83.4456	84.9197	85.2012	86.5371	86.5371	86.7890	86.0176	85.2012	84.6335	84.0480
alpha	6.5218	6.5426	6.5630	6.6613	6.6801	6.7691	6.7691	6.7859	6.7345	6.6801	6.6422	6.6032
util living area												
	0.9705	0.9451	0.9002	0.7890	0.6283	0.4438	0.3175	0.3434	0.5320	0.7962	0.9352	0.9747 (86)
MIT	20.4756	20.6167	20.7667	20.9196	20.9836	20.9986	20.9999	20.9998	20.9955	20.9277	20.7084	20.4573 (87)
Th 2	20.2202	20.2229	20.2255	20.2380	20.2403	20.2512	20.2512	20.2532	20.2470	20.2403	20.2356	20.2306 (88)
util rest of house												
	0.9630	0.9324	0.8789	0.7530	0.5810	0.3924	0.2635	0.2877	0.4755	0.7544	0.9185	0.9682 (89)
MIT 2	19.6321	19.8060	19.9855	20.1646	20.2280	20.2505	20.2511	20.2531	20.2444	20.1779	19.9300	19.6183 (90)

Living area fraction											fLA = Living area / (4) =	0.4403	(91)
MIT	20.0035	20.1629	20.3295	20.4971	20.5607	20.5799	20.5808	20.5819	20.5751	20.5080	20.2727	19.9877	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0035	20.1629	20.3295	20.4971	20.5607	20.5799	20.5808	20.5819	20.5751	20.5080	20.2727	19.9877	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9313	0.8820	0.7657	0.6012	0.4150	0.2873	0.3122	0.5003	0.7697	0.9194	0.9658	(94)
Useful gains	393.7880	420.8512	415.8873	377.9726	301.5691	203.0587	135.3635	141.7736	220.4647	321.3481	368.6427	382.8537	(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	557.9827	540.2999	487.7536	401.9185	306.0694	203.3710	135.3843	141.8099	221.5432	342.2469	458.0699	552.8286	(97)
Space heating kWh	122.1609	80.2696	53.4686	17.2411	3.3483	0.0000	0.0000	0.0000	0.0000	15.5487	64.3876	126.4613	(98a)
Space heating requirement - total per year (kWh/year)												482.8860	
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	122.1609	80.2696	53.4686	17.2411	3.3483	0.0000	0.0000	0.0000	0.0000	15.5487	64.3876	126.4613	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												482.8860	
Space heating per m2											(98c) / (4) =	11.3942	(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	122.1609	80.2696	53.4686	17.2411	3.3483	0.0000	0.0000	0.0000	0.0000	15.5487	64.3876	126.4613	(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)	132.3520	86.9659	57.9291	18.6794	3.6276	0.0000	0.0000	0.0000	0.0000	16.8459	69.7590	137.0112	(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	164.2759	145.4372	155.1921	138.4057	135.4238	123.4238	122.9638	127.1561	127.7583	140.7604	147.5422	162.7675	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.4052	82.7839	81.9277	80.7061	79.9956	79.8000	79.8000	79.8000	79.8000	80.6127	82.3353	83.5003	(217)
Fuel for water heating, kWh/month	196.9612	175.6830	189.4255	171.4936	169.2890	154.6665	154.0900	159.3435	160.0982	174.6132	179.1968	194.9305	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.8553	11.9175	10.7304	7.8616	6.0725	4.9613	5.5395	7.2005	9.3527	12.2713	13.8604	15.2682	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.7084	-21.5582	-32.2119	-37.7165	-42.0095	-39.7433	-39.3052	-36.4719	-31.6544	-25.3621	-16.4768	-12.6255	(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	-5.9758	-12.7844	-25.7977	-39.3026	-52.4887	-52.8899	-52.2199	-43.9340	-31.8674	-18.4119	-8.0239	-4.7062	(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	523.1701	(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	2079.7910	(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)	119.8912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-698.2459	(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	2110.6064	(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	523.1701	0.2100	109.8657	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2079.7910	0.2100	436.7561	(264)

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Space and water heating			546.6218	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	119.8912	0.1443	17.3040	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.8436	0.1337	-46.7879	
PV Unit electricity exported	-348.4023	0.1255	-43.7251	
Total			-90.5129	(269)
Total CO2, kg/year			485.3422	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	523.1701	1.1300	591.1822	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2079.7910	1.1300	2350.1638	(278)
Space and water heating			2941.3460	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	119.8912	1.5338	183.8931	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.8436	1.4942	-522.7467	
PV Unit electricity exported	-348.4023	0.4607	-160.4952	
Total			-683.2419	(283)
Total Primary energy kWh/year			2572.0980	(286)
Target Primary Energy Rate (TPER)			60.6900	(287)

BASELINE

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 04 - 2B3P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	77 C	**DER**	29.22	**TER**	11.52
Environmental	78 C	**% DER < TER**			-153.65
CO_2 Emissions (t/year)	1.62	**DFEE**	73.19	**TFEE**	29.36
Compliance Check	See BREL	**% DFEE < TFEE**			-149.24
% DPER < TPER	-163.97	**DPER**	160.07	**TPER**	60.64

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.4100	(1b)	x 3.1000	(2b) =	190.3710	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	190.3710	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1051 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6051 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5143 (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	0.6557	0.6429	0.6300	0.5657	0.5529	0.4886	0.4886	0.4757	0.5143	0.5529	0.5786	0.6043	(22b)
Effective ac	0.7150	0.7066	0.6985	0.6600	0.6528	0.6194	0.6194	0.6132	0.6323	0.6528	0.6674	0.6826	(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								
Ext Glazing - Resi New			9.0300	1.5038	13.5789			(27)
Ext Wall 1	44.5500	6.4500	38.1000	0.2600	9.9060			(29a)
Ext Wall 2	14.9700		14.9700	0.2600	3.8922			(29a)
Ext Wall 3	17.3000	2.5800	14.7200	0.2600	3.8272			(29a)
Total net area of external elements Aum(A, m2)			76.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4243			(33)
Main dwelling								
Party Wall 1			42.4400	0.5000	21.2200			(32)
Party Floor 1			42.3800					(32d)
Party Ceiling 1			42.3800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	15.3640	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	67.7883	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.9175	44.3931	43.8790	41.4644	41.0126	38.9095	38.9095	38.5201	39.7196	41.0126	41.9265	42.8820	(38)
Heat transfer coeff													

	112.7059	112.1814	111.6673	109.2527	108.8009	106.6979	106.6979	106.3084	107.5079	108.8009	109.7149	110.6703 (39)
Average = Sum(39)m / 12 =												109.2505

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8353	1.8268	1.8184	1.7791	1.7717	1.7375	1.7375	1.7311	1.7507	1.7717	1.7866	1.8022	(40)
HLP (average)												1.7790	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0212 (42)
Hot water usage for mixer showers												
	83.9314	82.6701	80.8321	77.3154	74.7202	71.8260	70.1810	72.0051	74.0046	77.1121	80.7043	83.6098 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	35.3292	34.0445	32.7598	31.4751	30.1904	28.9057	28.9057	30.1904	31.4751	32.7598	34.0445	35.3292 (42c)
Average daily hot water use (litres/day)												109.4994 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	119.2606	116.7146	113.5919	108.7905	104.9106	100.7317	99.0867	102.1955	105.4797	109.8719	114.7488	118.9390	(44)
Energy conte	188.8796	166.2000	174.5865	148.9288	141.2298	123.8614	119.8367	126.5393	130.0670	149.0951	163.4807	186.2298	(45)
Energy content (annual)										Total = Sum(45)m =		1818.9347	
Distribution loss (46)m = 0.15 x (45)m													
	28.3319	24.9300	26.1880	22.3393	21.1845	18.5792	17.9755	18.9809	19.5101	22.3643	24.5221	27.9345	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	267.9172	237.5888	253.6241	225.4168	220.2674	169.7734	167.2791	173.9817	175.9790	228.1327	239.9687	265.2674	(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													
	267.9172	237.5888	253.6241	225.4168	220.2674	169.7734	167.2791	173.9817	175.9790	228.1327	239.9687	265.2674	(64)
										Total per year (kWh/year) = Sum(64)m =		2625.1963	(64)
12Total per year (kWh/year)												2625	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	106.6886	94.9005	101.9361	91.9892	90.8450	59.1935	58.4556	60.6842	61.2569	93.4602	96.8277	105.8075	(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	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	90.2583	99.9289	90.2583	93.2669	90.2583	93.2669	90.2583	90.2583	93.2669	90.2583	93.2669	90.2583	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	176.4885	178.3199	173.7048	163.8799	151.4777	139.8214	132.0342	130.2028	134.8179	144.6428	157.0450	168.7013	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	(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)													
	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	(71)
Water heating gains (Table 5)													
	143.3986	141.2210	137.0109	127.7628	122.1035	82.2132	78.5694	81.5648	85.0790	125.6185	134.4829	142.2144	(72)
Total internal gains													
	463.4635	472.7879	454.2921	438.2277	417.1576	368.6196	354.1801	355.3441	366.4819	413.8378	438.1130	454.4921	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.4500	36.7938	0.4000	0.9000	0.7700	59.2066	(77)
Northwest	2.5800	11.2829	0.4000	0.9000	0.7700	7.2624	(81)

Solar gains	66.4690	115.6336	164.6223	214.7148	250.3012	252.8031	241.9348	214.7265	181.8661	129.5273	80.0538	56.5994	(83)
Total gains	529.9325	588.4215	618.9144	652.9425	667.4588	621.4227	596.1148	570.0706	548.3480	543.3651	518.1668	511.0915	(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	37.8382	38.0151	38.1901	39.0341	39.1962	39.9688	39.9688	40.1152	39.6676	39.1962	38.8697	38.5341	
alpha	3.5225	3.5343	3.5460	3.6023	3.6131	3.6646	3.6646	3.6743	3.6445	3.6131	3.5913	3.5689	
util living area													
	0.9917	0.9871	0.9793	0.9585	0.9113	0.8210	0.6837	0.7222	0.8851	0.9620	0.9862	0.9928	(86)
MIT	19.3335	19.4847	19.7308	20.0968	20.4401	20.7117	20.8427	20.8245	20.6127	20.1987	19.7246	19.3317	(87)
Th 2	20.0823	20.0866	20.0908	20.1105	20.1141	20.1313	20.1313	20.1344	20.1247	20.1141	20.1067	20.0989	(88)
util rest of house													

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	0.9901	0.9846	0.9750	0.9487	0.8872	0.7649	0.5830	0.6278	0.8448	0.9512	0.9831	0.9914	(89)
MIT 2	18.5353	18.6890	18.9369	19.3139	19.6487	19.9113	20.0126	20.0042	19.8224	19.4193	18.9444	18.5465	(90)
Living area fraction										fLA = Living area / (4) =		0.2526	(91)
MIT	18.7369	18.8900	19.1374	19.5116	19.8485	20.1135	20.2222	20.2114	20.0220	19.6162	19.1414	18.7448	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7369	18.8900	19.1374	19.5116	19.8485	20.1135	20.2222	20.2114	20.0220	19.6162	19.1414	18.7448	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9803	0.9691	0.9405	0.8786	0.7636	0.5946	0.6372	0.8391	0.9435	0.9786	0.9886	(94)
Useful gains	523.0201	576.8090	599.7726	614.1233	586.4441	474.5072	354.4717	363.2594	460.1068	512.6770	507.0906	505.2475	(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													
	1627.1198	1569.4191	1411.1859	1159.3505	886.5694	588.2744	386.4829	405.1859	636.6626	980.9678	1321.1228	1609.6786	(97)
Space heating kWh													
	821.4502	667.0340	603.6915	392.5636	223.2932	0.0000	0.0000	0.0000	0.0000	348.4084	586.1032	821.6967	(98a)
Space heating requirement - total per year (kWh/year)												4464.2408	
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													
	821.4502	667.0340	603.6915	392.5636	223.2932	0.0000	0.0000	0.0000	0.0000	348.4084	586.1032	821.6967	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4464.2408	
Space heating per m2											(98c) / (4) =	72.6957	(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 %)												84.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	821.4502	667.0340	603.6915	392.5636	223.2932	0.0000	0.0000	0.0000	0.0000	348.4084	586.1032	821.6967	(98)
Space heating efficiency (main heating system 1)													
	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)													
	972.1304	789.3893	714.4278	464.5723	264.2523	0.0000	0.0000	0.0000	0.0000	412.3176	693.6133	972.4222	(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													
	267.9172	237.5888	253.6241	225.4168	220.2674	169.7734	167.2791	173.9817	175.9790	228.1327	239.9687	265.2674	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month													
	317.0618	281.1702	300.1468	266.7654	260.6715	200.9153	197.9635	205.8955	208.2592	269.9795	283.9866	313.9259	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	17.7250	14.2196	12.8032	9.3802	7.2455	5.9197	6.6096	8.5914	11.1594	14.6417	16.5378	18.2176	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	5283.1252	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3106.7411	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.0508	(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	8618.9172	(238)

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

	Energy	Emission factor	Emissions

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	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	5283.1252	0.2100	1109.4563	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3106.7411	0.2100	652.4156	(264)
Space and water heating			1761.8719	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.0508	0.1443	20.6467	(268)
Total CO2, kg/year			1794.4478	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			29.2200	(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	5283.1252	1.1300	5969.9315	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3106.7411	1.1300	3510.6175	(278)
Space and water heating			9480.5490	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.0508	1.5338	219.4161	(282)
Total Primary energy kWh/year			9830.0659	(286)
Dwelling Primary energy Rate (DPER)			160.0700	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.4100	(1b)	x 3.1000	(2b) =	190.3710	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	190.3710	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1051	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3551	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3018	(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	0.3848	0.3772	0.3697	0.3320	0.3244	0.2867	0.2867	0.2792	0.3018	0.3244	0.3395	0.3546	(22b)
Effective ac	0.5740	0.5712	0.5683	0.5551	0.5526	0.5411	0.5411	0.5390	0.5455	0.5526	0.5576	0.5629	(25)

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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 Opening Type			9.0300	1.1450	10.3397			(27)
Ext Wall 1	44.5500	6.4500	38.1000	0.1800	6.8580			(29a)
Ext Wall 2	14.9700		14.9700	0.1800	2.6946			(29a)
Ext Wall 3	17.3000	2.5800	14.7200	0.1800	2.6496			(29a)
Total net area of external elements Aum(A, m2)			76.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.5419			(33)
Main dwelling								
Party Wall 1			42.4400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	3.8410	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 26.3829	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.0622	35.8816	35.7045	34.8731	34.7175	33.9933	33.9933	33.8592	34.2722	34.7175	35.0322	35.3612	(38)
Heat transfer coeff													

	62.4451	62.2645	62.0874	61.2559	61.1004	60.3762	60.3762	60.2421	60.6551	61.1004	61.4151	61.7441 (39)
Average = Sum(39)m / 12 =												61.2552

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0169	1.0139	1.0110	0.9975	0.9950	0.9832	0.9832	0.9810	0.9877	0.9950	1.0001	1.0054	(40)
HLP (average)												0.9975	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0212 (42)
Hot water usage for mixer showers												
	74.6057	73.4845	71.8507	68.7248	66.4179	63.8454	62.3831	64.0045	65.7819	68.5441	71.7371	74.3199 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	35.3292	34.0445	32.7598	31.4751	30.1904	28.9057	28.9057	30.1904	31.4751	32.7598	34.0445	35.3292 (42c)
Average daily hot water use (litres/day)												100.9014 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.9349	107.5290	104.6105	100.1999	96.6083	92.7510	91.2888	94.1949	97.2570	101.3038	105.7816	109.6490	(44)
Energy conte	174.1100	153.1199	160.7825	137.1687	130.0534	114.0482	110.4059	116.6330	119.9276	137.4684	150.7053	171.6839	(45)
Energy content (annual)										Total = Sum(45)m =		1676.1066	
Distribution loss (46)m = 0.15 x (45)m													
	26.1165	22.9680	24.1174	20.5753	19.5080	17.1072	16.5609	17.4949	17.9891	20.6203	22.6058	25.7526	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)
Total storage loss													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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													
	225.0361	199.1176	211.7086	186.4520	180.9795	163.3315	161.3319	167.5590	169.2109	188.3944	199.9886	222.6100	(62)
WWHRS	-34.1066	-30.1642	-31.5862	-26.1546	-24.3752	-20.8580	-19.5510	-20.7906	-21.5805	-25.4410	-28.8216	-33.4750	(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													
	190.9294	168.9535	180.1224	160.2973	156.6043	142.4735	141.7809	146.7685	147.6304	162.9534	171.1670	189.1350	(64)
										Total per year (kWh/year) = Sum(64)m =		1958.8157	(64)
12Total per year (kWh/year)												1959	(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													
	98.6324	87.7106	94.2010	85.0352	83.9836	77.3477	77.4508	79.5213	79.3026	86.4491	89.5362	97.8258	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	94.4967	104.6214	94.4967	97.6466	94.4967	97.6466	94.4967	94.4967	97.6466	94.4967	97.6466	94.4967	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	176.4885	178.3199	173.7048	163.8799	151.4777	139.8214	132.0342	130.2028	134.8179	144.6428	157.0450	168.7013	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	(71)
Water heating gains (Table 5)													
	132.5705	130.5217	126.6143	118.1045	112.8812	107.4273	104.1006	106.8835	110.1424	116.1950	124.3558	131.4862	(72)
Total internal gains													
	459.8738	469.7810	451.1339	435.9491	415.1737	398.2134	383.9496	384.9011	395.9250	411.6526	435.3655	451.0024	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.4500	36.7938	0.6300	0.7000	0.7700	72.5281	(77)
Northwest	2.5800	11.2829	0.6300	0.7000	0.7700	8.8964	(81)

Solar gains	81.4245	141.6511	201.6623	263.0256	306.6190	309.6838	296.3701	263.0399	222.7859	158.6710	98.0660	69.3342	(83)
Total gains	541.2983	611.4321	652.7962	698.9747	721.7927	707.8972	680.3197	647.9410	618.7110	570.3236	533.4315	520.3366	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.2934	68.4915	68.6867	69.6191	69.7964	70.6335	70.6335	70.7908	70.3087	69.7964	69.4387	69.0687	
alpha	5.5529	5.5661	5.5791	5.6413	5.6531	5.7089	5.7089	5.7194	5.6872	5.6531	5.6292	5.6046	
util living area													
	0.9872	0.9741	0.9480	0.8732	0.7329	0.5379	0.3894	0.4258	0.6509	0.8916	0.9722	0.9895	(86)
MIT	20.0904	20.2717	20.4960	20.7650	20.9295	20.9899	20.9986	20.9978	20.9715	20.7719	20.3987	20.0634	(87)
Th 2	20.0693	20.0718	20.0742	20.0854	20.0875	20.0974	20.0974	20.0992	20.0936	20.0875	20.0833	20.0788	(88)
util rest of house													

	0.9834	0.9668	0.9334	0.8408	0.6769	0.4656	0.3101	0.3434	0.5755	0.8565	0.9630	0.9863	(89)
MIT 2	19.0308	19.2597	19.5376	19.8609	20.0325	20.0920	20.0970	20.0985	20.0763	19.8773	19.4300	19.0040	(90)
Living area fraction										fLA = Living area / (4) =		0.2526	(91)
MIT	19.2984	19.5153	19.7797	20.0892	20.2590	20.3187	20.3247	20.3256	20.3024	20.1033	19.6746	19.2716	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2984	19.5153	19.7797	20.0892	20.2590	20.3187	20.3247	20.3256	20.3024	20.1033	19.6746	19.2716	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9613	0.9279	0.8410	0.6880	0.4836	0.3302	0.3643	0.5935	0.8572	0.9578	0.9827	(94)
Useful gains	530.1108	587.7602	605.7202	587.8217	496.5619	342.3166	224.6116	236.0143	367.1756	488.8888	510.9452	511.3203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	936.5779	910.0141	824.4996	685.4077	522.9595	345.2754	224.8828	236.4858	376.2068	580.6539	772.2732	930.5797	(97)
Space heating kWh													
	302.4116	216.5546	162.7719	70.2619	19.6398	0.0000	0.0000	0.0000	0.0000	68.2732	188.1562	311.9290	(98a)
Space heating requirement - total per year (kWh/year)												1339.9982	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	302.4116	216.5546	162.7719	70.2619	19.6398	0.0000	0.0000	0.0000	0.0000	68.2732	188.1562	311.9290	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1339.9982	
Space heating per m2											(98c) / (4) =	21.8205	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	302.4116	216.5546	162.7719	70.2619	19.6398	0.0000	0.0000	0.0000	0.0000	68.2732	188.1562	311.9290	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	327.6398	234.6204	176.3509	76.1234	21.2783	0.0000	0.0000	0.0000	0.0000	73.9688	203.8528	337.9513	(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													
	190.9294	168.9535	180.1224	160.2973	156.6043	142.4735	141.7809	146.7685	147.6304	162.9534	171.1670	189.1350	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0862	84.6175	83.8333	82.3433	80.7116	79.8000	79.8000	79.8000	79.8000	82.2617	84.2725	85.1740	(217)
Fuel for water heating, kWh/month													
	224.3954	199.6672	214.8577	194.6696	194.0296	178.5383	177.6703	183.9204	185.0005	198.0914	203.1114	222.0571	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.6346	15.7516	14.1825	10.3907	8.0261	6.5574	7.3217	9.5170	12.3616	16.2191	18.3195	20.1803	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.0114	-30.6396	-45.5403	-53.0124	-58.7458	-55.4270	-54.7704	-50.9399	-44.4235	-35.8628	-23.4666	-18.0503	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9607	-19.1239	-38.5175	-58.5906	-78.1851	-78.8015	-77.8524	-65.5708	-47.6216	-27.5671	-12.0357	-7.0639	(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												1451.7857	(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												2376.0089	(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)												158.4621	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1011.7810	(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												3060.4757	(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	1451.7857	0.2100	304.8750	(261)

Full SAP Calculation Printout

Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2376.0089	0.2100	498.9619	(264)
Space and water heating			803.8369	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.4621	0.1443	22.8710	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-491.8902	0.1339	-65.8488	
PV Unit electricity exported	-519.8908	0.1255	-65.2624	
Total			-131.1112	(269)
Total CO2, kg/year			707.5260	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1451.7857	1.1300	1640.5179	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2376.0089	1.1300	2684.8901	(278)
Space and water heating			4325.4079	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.4621	1.5338	243.0544	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-491.8902	1.4947	-735.2362	
PV Unit electricity exported	-519.8908	0.4608	-239.5491	
Total			-974.7853	(283)
Total Primary energy kWh/year			3723.7779	(286)
Target Primary Energy Rate (TPER)			60.6400	(287)

BASELINE

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 05 - 1B1P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	74 C	**DER**	38.24	**TER**	14.95
Environmental	77 C	**% DER < TER**			-155.79
CO_2 Emissions (t/year)	1.37	**DFEE**	94.07	**TFEE**	34.20
Compliance Check	See BREL	**% DFEE < TFEE**			-175.07
% DPER < TPER	-163.39	**DPER**	209.29	**TPER**	79.46

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.3900	(1b)	x 3.1000	(2b) =	122.1090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	122.1090	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1638	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6638	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5642	(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	0.7194	0.7053	0.6912	0.6206	0.6065	0.5360	0.5360	0.5219	0.5642	0.6065	0.6347	0.6630	(22b)
Effective ac	0.7588	0.7487	0.7389	0.6926	0.6839	0.6437	0.6437	0.6362	0.6592	0.6839	0.7015	0.7198	(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								
Ext Glazing - Resi New			6.2200	1.5038	9.3534			(27)
Ext Wall 1	24.9600	5.2300	19.7300	0.2600	5.1298			(29a)
Ext Wall 2	15.1900	0.9900	14.2000	0.2600	3.6920			(29a)
External Roof 1	39.3900		39.3900	0.1600	6.3024			(30)
Total net area of external elements Aum(A, m2)			79.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.4726			(33)
Main dwelling								
Party Wall 1			39.9900	0.5000	19.9950			(32)
Party Floor 1			39.3900					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	15.9080	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 60.3806	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.5747	30.1698	29.7730	27.9089	27.5602	25.9366	25.9366	25.6360	26.5620	27.5602	28.2657	29.0033	(38)
Heat transfer coeff	90.9553	90.5504	90.1536	88.2895	87.9407	86.3172	86.3172	86.0165	86.9426	87.9407	88.6463	89.3839	(39)

Average = Sum(39)m / 12 = 88.2878

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.3091	2.2988	2.2887	2.2414	2.2326	2.1913	2.1913	2.1837	2.2072	2.2326	2.2505	2.2692	(40)
HLP (average)												2.2414	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3902 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.5907	67.5599	66.0579	63.1840	61.0631	58.6979	57.3535	58.8442	60.4783	63.0178	65.9534	68.3279	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	28.8672	27.8175	26.7678	25.7181	24.6684	23.6186	23.6186	24.6684	25.7181	26.7678	27.8175	28.8672	(42c)
Average daily hot water use (litres/day)												89.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.4580	95.3775	92.8257	88.9021	85.7315	82.3166	80.9722	83.5126	86.1964	89.7856	93.7710	97.1952	(44)
Energy conte	154.3496	135.8162	142.6696	121.7025	115.4110	101.2178	97.9288	103.4060	106.2888	121.8382	133.5939	152.1841	(45)
Energy content (annual)										Total = Sum(45)m =		1486.4066	
Distribution loss (46)m = 0.15 x (45)m	23.1524	20.3724	21.4004	18.2554	17.3117	15.1827	14.6893	15.5109	15.9433	18.2757	20.0391	22.8276	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	233.3872	207.2050	221.7072	198.1905	194.4486	147.1298	145.3712	150.8484	152.2008	200.8758	210.0819	231.2217	(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	233.3872	207.2050	221.7072	198.1905	194.4486	147.1298	145.3712	150.8484	152.2008	200.8758	210.0819	231.2217	(64)
										Total per year (kWh/year) = Sum(64)m =		2292.6682	(64)
12Total per year (kWh/year)												2293	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.2073	84.7979	91.3237	82.9365	82.2602	51.6645	51.1713	52.9924	53.3506	84.3973	86.8904	94.4873	(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	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.8629	67.3839	60.8629	62.8916	60.8629	62.8916	60.8629	60.8629	62.8916	60.8629	62.8916	60.8629	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	120.0024	121.2476	118.1096	111.4292	102.9964	95.0708	89.7759	88.5307	91.6687	98.3491	106.7819	114.7075	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	(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)	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	(71)
Water heating gains (Table 5)	127.9668	126.1874	122.7469	115.1895	110.5648	71.7563	68.7786	71.2264	74.0981	113.4372	120.6811	126.9991	(72)
Total internal gains	352.6854	358.6722	345.5727	333.3637	318.2774	273.5720	263.2707	264.4732	272.5117	316.5024	334.2079	346.4228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.9900	11.2829	0.4000	0.9000	0.7700	2.7867	(75)
Southeast	5.2300	36.7938	0.4000	0.9000	0.7700	48.0079	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	50.7946	87.4476	122.1083	155.4192	177.8440	178.2125	171.1273	154.1444	133.6046	97.3112	61.0088	43.3605	(83)
Total gains	403.4799	446.1198	467.6810	488.7829	496.1214	451.7844	434.3979	418.6177	406.1163	413.8136	395.2167	389.7833	(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	30.0743	30.2088	30.3417	30.9824	31.1052	31.6903	31.6903	31.8011	31.4623	31.1052	30.8577	30.6030	
alpha	3.0050	3.0139	3.0228	3.0655	3.0737	3.1127	3.1127	3.1201	3.0975	3.0737	3.0572	3.0402	
util living area	0.9863	0.9803	0.9708	0.9485	0.9027	0.8269	0.7039	0.7355	0.8791	0.9502	0.9788	0.9877	(86)
MIT	19.0086	19.1755	19.4561	19.8702	20.2692	20.5944	20.7743	20.7507	20.4851	20.0111	19.4622	19.0057	(87)
Th 2	19.8455	19.8506	19.8556	19.8793	19.8837	19.9043	19.9043	19.9081	19.8964	19.8837	19.8748	19.8654	(88)
util rest of house	0.9834	0.9761	0.9641	0.9352	0.8731	0.7619	0.5826	0.6230	0.8305	0.9348	0.9736	0.9851	(89)

MIT 2	18.0291	18.1987	18.4809	18.9069	19.2953	19.6106	19.7505	19.7393	19.5119	19.0514	18.5031	18.0414	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	18.4100	18.5786	18.8602	19.2816	19.6741	19.9932	20.1486	20.1327	19.8904	19.4247	18.8761	18.4164	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4100	18.5786	18.8602	19.2816	19.6741	19.9932	20.1486	20.1327	19.8904	19.4247	18.8761	18.4164	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9700	0.9566	0.9264	0.8664	0.7681	0.6132	0.6495	0.8302	0.9268	0.9675	0.9808	(94)
Useful gains	394.8492	432.7489	447.3923	452.7901	429.8348	347.0017	266.3731	271.8874	337.1637	383.5152	382.3598	382.2828	(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	1283.3817	1238.6035	1114.3125	916.5856	701.2454	465.5295	306.3091	321.0708	503.4347	776.0476	1043.9069	1270.7201	(97)
Space heating kWh	661.0682	541.5343	496.1886	333.9328	201.9294	0.0000	0.0000	0.0000	0.0000	292.0441	476.3139	660.9973	(98a)
Space heating requirement - total per year (kWh/year)												3664.0087	
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	661.0682	541.5343	496.1886	333.9328	201.9294	0.0000	0.0000	0.0000	0.0000	292.0441	476.3139	660.9973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3664.0087	
Space heating per m2											(98c) / (4) =	93.0188	(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 %)												84.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	661.0682	541.5343	496.1886	333.9328	201.9294	0.0000	0.0000	0.0000	0.0000	292.0441	476.3139	660.9973	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	782.3292	640.8690	587.2055	395.1867	238.9698	0.0000	0.0000	0.0000	0.0000	345.6143	563.6851	782.2454	(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	233.3872	207.2050	221.7072	198.1905	194.4486	147.1298	145.3712	150.8484	152.2008	200.8758	210.0819	231.2217	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month	276.1979	245.2131	262.3754	234.5449	230.1167	174.1181	172.0370	178.5189	180.1192	237.7228	248.6176	273.6352	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	11.9523	9.5886	8.6334	6.3252	4.8858	3.9917	4.4570	5.7934	7.5250	9.8732	11.1518	12.2845	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4336.1049	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2713.2169	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	96.4618	(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	7231.7836	(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	4336.1049	0.2100	910.5820	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2713.2169	0.2100	569.7755	(264)
Space and water heating			1480.3576	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	96.4618	0.1443	13.9224	(268)
Total CO2, kg/year			1506.2093	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			38.2400	(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	4336.1049	1.1300	4899.7986	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2713.2169	1.1300	3065.9351	(278)
Space and water heating			7965.7336	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	96.4618	1.5338	147.9564	(282)
Total Primary energy kWh/year			8243.7908	(286)
Dwelling Primary energy Rate (DPER)			209.2900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.3900	(1b) x	3.1000	(2b) =	122.1090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		122.1090	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1638	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4138	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3517	(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	0.4484	0.4396	0.4309	0.3869	0.3781	0.3341	0.3341	0.3253	0.3517	0.3781	0.3957	0.4133	(22b)
Effective ac	0.6006	0.5966	0.5928	0.5748	0.5715	0.5558	0.5558	0.5529	0.5619	0.5715	0.5783	0.5854	(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 Opening Type			6.2200	1.1450	7.1221			(27)
Ext Wall 1	24.9600	5.2300	19.7300	0.1800	3.5514			(29a)
Ext Wall 2	15.1900	0.9900	14.2000	0.1800	2.5560			(29a)
External Roof 1	39.3900		39.3900	0.1100	4.3329			(30)
Total net area of external elements Aum(A, m2)			79.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5624			(33)
Main dwelling								
Party Wall 1			39.9900	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.9770	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		21.5394	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.1998	24.0424	23.8882	23.1638	23.0283	22.3974	22.3974	22.2806	22.6404	23.0283	23.3025	23.5891	(38)
Heat transfer coeff	45.7392	45.5819	45.4276	44.7033	44.5678	43.9369	43.9369	43.8200	44.1799	44.5678	44.8419	45.1286	(39)

Average = Sum(39)m / 12 = 44.7026

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1612	1.1572	1.1533	1.1349	1.1314	1.1154	1.1154	1.1125	1.1216	1.1314	1.1384	1.1457	(40)
HLP (average)												1.1349	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3902 (42)

Hot water usage for mixer showers

60.9695	60.0533	58.7181	56.1635	54.2783	52.1759	50.9809	52.3060	53.7585	56.0158	58.6253	60.7359	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

28.8672	27.8175	26.7678	25.7181	24.6684	23.6186	23.6186	24.6684	25.7181	26.7678	27.8175	28.8672	(42c)

Average daily hot water use (litres/day) 82.4548 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	89.8368	87.8708	85.4859	81.8816	78.9467	75.7946	74.5996	76.9743	79.4766	82.7836	86.4428	89.6032	(44)
Energy conte	142.2795	125.1268	131.3887	112.0918	106.2774	93.1983	90.2217	95.3103	98.0026	112.3366	123.1536	140.2969	(45)
Energy content (annual)										Total = Sum(45)m =		1369.6842	
Distribution loss (46)m = 0.15 x (45)m	21.3419	18.7690	19.7083	16.8138	15.9416	13.9797	13.5333	14.2965	14.7004	16.8505	18.4730	21.0445	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	188.8744	167.2126	177.9836	157.1837	152.8723	138.2901	136.8166	141.9052	143.0944	158.9315	168.2454	186.8918	(62)
WWHRS	-27.8727	-24.6509	-25.8130	-21.3742	-19.9199	-17.0456	-15.9776	-16.9905	-17.6361	-20.7910	-23.5537	-27.3566	(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	161.0017	142.5617	152.1706	135.8095	132.9523	121.2445	120.8391	124.9147	125.4583	138.1405	144.6918	159.5352	(64)
									Total per year (kWh/year) = Sum(64)m =			1659.3199	(64)
12Total per year (kWh/year)												1659	(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	84.5839	75.2733	80.9627	73.3440	72.6132	67.0619	67.2746	68.9666	68.6593	74.6278	77.0220	83.9246	(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	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3124	70.0959	63.3124	65.4229	63.3124	65.4229	63.3124	63.3124	65.4229	63.3124	65.4229	63.3124	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	120.0024	121.2476	118.1096	111.4292	102.9964	95.0708	89.7759	88.5307	91.6687	98.3491	106.7819	114.7075	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	(71)
Water heating gains (Table 5)	113.6880	112.0138	108.8208	101.8667	97.5983	93.1415	90.4229	92.6970	95.3602	100.3062	106.9751	112.8019	(72)
Total internal gains	343.8561	350.2106	337.0961	325.5720	310.7605	297.4884	287.3646	288.3935	296.3050	308.8210	326.0331	337.6752	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.9900	11.2829	0.6300	0.7000	0.7700	3.4137	(75)
Southeast	5.2300	36.7938	0.6300	0.7000	0.7700	58.8096	(77)

Solar gains	62.2234	107.1233	149.5827	190.3885	217.8589	218.3103	209.6309	188.8269	163.6656	119.2062	74.7358	53.1166	(83)
Total gains	406.0794	457.3339	486.6788	515.9605	528.6193	515.7987	496.9955	477.2204	459.9706	428.0272	400.7689	390.7918	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.8046	60.0111	60.2148	61.1905	61.3766	62.2579	62.2579	62.4239	61.9155	61.3766	61.0013	60.6139	
alpha	4.9870	5.0007	5.0143	5.0794	5.0918	5.1505	5.1505	5.1616	5.1277	5.0918	5.0668	5.0409	
util living area	0.9795	0.9624	0.9317	0.8546	0.7206	0.5340	0.3871	0.4195	0.6333	0.8672	0.9591	0.9825	(86)
MIT	20.0057	20.2017	20.4417	20.7272	20.9084	20.9842	20.9975	20.9962	20.9629	20.7480	20.3484	19.9808	(87)
Th 2	19.9512	19.9544	19.9576	19.9724	19.9752	19.9883	19.9883	19.9907	19.9832	19.9752	19.9696	19.9637	(88)
util rest of house	0.9735	0.9519	0.9129	0.8177	0.6597	0.4544	0.2991	0.3290	0.5515	0.8256	0.9459	0.9774	(89)

MIT 2	18.8341	19.0796	19.3746	19.7165	19.9049	19.9800	19.9875	19.9895	19.9613	19.7494	19.2767	18.8124	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	19.2898	19.5160	19.7896	20.1096	20.2952	20.3706	20.3803	20.3810	20.3509	20.1378	19.6935	19.2668	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2898	19.5160	19.7896	20.1096	20.2952	20.3706	20.3803	20.3810	20.3509	20.1378	19.6935	19.2668	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9687	0.9466	0.9094	0.8231	0.6796	0.4850	0.3334	0.3643	0.5820	0.8329	0.9416	0.9730	(94)
Useful gains	393.3774	432.9298	442.5961	424.6704	359.2567	250.1746	165.7042	173.8335	267.7256	356.5210	377.3769	380.2311	(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	685.6192	666.2236	603.7157	501.1059	383.0676	253.5417	166.0956	174.4488	276.1622	425.0769	564.7170	679.9442	(97)
Space heating kWh	217.4279	156.7734	119.8730	55.0335	17.7153	0.0000	0.0000	0.0000	0.0000	51.0056	134.8849	222.9866	(98a)
Space heating requirement - total per year (kWh/year)												975.7002	
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	217.4279	156.7734	119.8730	55.0335	17.7153	0.0000	0.0000	0.0000	0.0000	51.0056	134.8849	222.9866	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												975.7002	
Space heating per m2											(98c) / (4) =	24.7703	(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	217.4279	156.7734	119.8730	55.0335	17.7153	0.0000	0.0000	0.0000	0.0000	51.0056	134.8849	222.9866	(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)	235.5665	169.8521	129.8732	59.6246	19.1932	0.0000	0.0000	0.0000	0.0000	55.2607	146.1375	241.5889	(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	161.0017	142.5617	152.1706	135.8095	132.9523	121.2445	120.8391	124.9147	125.4583	138.1405	144.6918	159.5352	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7342	84.2734	83.5304	82.2025	80.7624	79.8000	79.8000	79.8000	79.8000	82.0423	83.9027	84.8108	(217)
Fuel for water heating, kWh/month	190.0078	169.1658	182.1739	165.2133	164.6215	151.9354	151.4274	156.5347	157.2160	168.3772	172.4519	188.1073	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.1551	10.5535	9.5022	6.9618	5.3775	4.3934	4.9055	6.3764	8.2823	10.8668	12.2740	13.5207	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.7039	-20.1064	-30.0781	-35.2677	-39.3328	-37.2360	-36.8268	-34.1444	-29.5955	-23.6734	-15.3588	-11.7611	(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	-5.5210	-11.8132	-23.8388	-36.3175	-48.4983	-48.8618	-48.2410	-40.5887	-29.4447	-17.0122	-7.4133	-4.3478	(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	1057.0967	(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	2017.2323	(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)	106.1690	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-648.9831	(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	2617.5148	(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	1057.0967	0.2100	221.9903	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	2017.2323	0.2100	423.6188	(264)
Space and water heating			645.6091	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	106.1690	0.1443	15.3235	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-327.0850	0.1337	-43.7347	
PV Unit electricity exported	-321.8982	0.1255	-40.3995	
Total			-84.1342	(269)
Total CO2, kg/year			588.7276	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9500	(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	1057.0967	1.1300	1194.5192	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2017.2323	1.1300	2279.4725	(278)
Space and water heating			3473.9917	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	106.1690	1.5338	162.8456	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-327.0850	1.4941	-488.7046	
PV Unit electricity exported	-321.8982	0.4607	-148.2886	
Total			-636.9932	(283)
Total Primary energy kWh/year			3129.9449	(286)
Target Primary Energy Rate (TPER)			79.4600	(287)

BASELINE

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elmhurst energy

Property Reference	Flat 06 - 1B1P			Issued on Date	20/08/2025
Assessment Reference	00001		Prop Type Ref		
Property	Wells Road				

SAP Rating	74 C	DER	37.37	TER	14.69
Environmental	77 C	% DER < TER			-154.39
CO_2 Emissions (t/year)	1.37	DFEE	91.53	TFEE	33.87
Compliance Check	See BREL	% DFEE < TFEE			-170.28
% DPER < TPER	-161.95	DPER	204.56	TPER	78.09

Assessor Details	[redacted]	Assessor ID	BQ15-0004
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	40.4000	(1b)	x 3.1000	(2b) =	125.2400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.4000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.2400	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1597 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6597 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5607 (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	0.7149	0.7009	0.6869	0.6168	0.6028	0.5327	0.5327	0.5187	0.5607	0.6028	0.6308	0.6589	(22b)
Effective ac	0.7556	0.7456	0.7359	0.6902	0.6817	0.6419	0.6419	0.6345	0.6572	0.6817	0.6990	0.7171	(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								
Ext Glazing - Resi New			6.2200	1.5038	9.3534			(27)
Ext Wall 1	29.2600	5.2300	24.0300	0.3000	7.2090			(29a)
Ext Wall 2	3.4700	0.9900	2.4800	0.3000	0.7440			(29a)
Ext Wall 3	8.6800		8.6800	0.3000	2.6040			(29a)
External Roof 1	39.3900		39.3900	0.1600	6.3024			(30)
Total net area of external elements Aum(A, m2)			80.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.0228			(33)
Main dwelling								
Party Wall 1			35.6200	0.5000	17.8100			(32)
Party Floor 1			39.3900					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	16.1600	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 60.1828	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.2272	30.8170	30.4150	28.5266	28.1733	26.5286	26.5286	26.2241	27.1621	28.1733	28.8881	29.6353	(38)
Heat transfer coeff													

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	91.4100	90.9998	90.5978	88.7094	88.3561	86.7114	86.7114	86.4068	87.3449	88.3561	89.0708	89.8181 (39)
Average = Sum(39)m / 12 =												88.7077

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2626	2.2525	2.2425	2.1958	2.1870	2.1463	2.1463	2.1388	2.1620	2.1870	2.2047	2.2232	(40)
HLP (average)												2.1957	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4170 (42)
Hot water usage for mixer showers												
	69.2420	68.2015	66.6851	63.7839	61.6429	59.2553	57.8981	59.4030	61.0526	63.6162	66.5797	68.9767 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	29.1416	28.0819	27.0222	25.9625	24.9028	23.8431	23.8431	24.9028	25.9625	27.0222	28.0819	29.1416 (42c)
Average daily hot water use (litres/day)												90.3312 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	98.3836	96.2833	93.7073	89.7464	86.5457	83.0984	81.7412	84.3058	87.0151	90.6384	94.6616	98.1183	(44)
Energy conte	155.8156	137.1062	144.0247	122.8584	116.5072	102.1792	98.8590	104.3882	107.2983	122.9954	134.8628	153.6295	(45)
Energy content (annual)											Total = Sum(45)m =	1500.5242	
Distribution loss (46)m = 0.15 x (45)m													
	23.3723	20.5659	21.6037	18.4288	17.4761	15.3269	14.8288	15.6582	16.0947	18.4493	20.2294	23.0444	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	234.8532	208.4950	223.0623	199.3464	195.5448	148.0912	146.3014	151.8306	153.2103	202.0330	211.3508	232.6671	(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													
	234.8532	208.4950	223.0623	199.3464	195.5448	148.0912	146.3014	151.8306	153.2103	202.0330	211.3508	232.6671	(64)
										Total per year (kWh/year) = Sum(64)m =		2306.7858	(64)
12Total per year (kWh/year)												2307	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.6948	85.2268	91.7743	83.3208	82.6247	51.9842	51.4805	53.3190	53.6863	84.7820	87.3123	94.9679	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	62.3122	68.9885	62.3122	64.3892	62.3122	64.3892	62.3122	62.3122	64.3892	62.3122	64.3892	62.3122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	122.5407	123.8123	120.6080	113.7862	105.1751	97.0818	91.6749	90.4034	93.6077	100.4294	109.0406	117.1339	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	(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)													
	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	(71)
Water heating gains (Table 5)													
	128.6220	126.8257	123.3525	115.7233	111.0547	72.2002	69.1942	71.6653	74.5643	113.9544	121.2670	127.6450	(72)
Total internal gains													
	357.7300	363.8816	350.5278	338.1539	322.7971	277.9264	267.4365	268.6359	276.8163	320.9511	338.9520	351.3462	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.9900	11.2829	0.4000	0.9000	0.7700	2.7867	(75)
Southeast	5.2300	36.7938	0.4000	0.9000	0.7700	48.0079	(77)

Solar gains	50.7946	87.4476	122.1083	155.4192	177.8440	178.2125	171.1273	154.1444	133.6046	97.3112	61.0088	43.3605	(83)
Total gains	408.5246	451.3292	472.6361	493.5731	500.6410	456.1388	438.5637	422.7804	410.4209	418.2622	399.9608	394.7067	(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	30.6920	30.8304	30.9672	31.6264	31.7528	32.3551	32.3551	32.4691	32.1204	31.7528	31.4980	31.2360
alpha	3.0461	3.0554	3.0645	3.1084	3.1169	3.1570	3.1570	3.1646	3.1414	3.1169	3.0999	3.0824
util living area												
	0.9867	0.9809	0.9716	0.9497	0.9041	0.8280	0.7042	0.7359	0.8802	0.9512	0.9794	0.9881 (86)
MIT	19.0402	19.2051	19.4816	19.8904	20.2836	20.6040	20.7802	20.7573	20.4965	20.0292	19.4880	19.0377 (87)
Th 2	19.8687	19.8738	19.8787	19.9021	19.9065	19.9268	19.9268	19.9306	19.9190	19.9065	19.8976	19.8884 (88)
util rest of house												

	0.9840	0.9769	0.9652	0.9368	0.8753	0.7642	0.5850	0.6253	0.8326	0.9363	0.9744	0.9857	(89)
MIT 2	18.0781	18.2457	18.5239	18.9447	19.3277	19.6386	19.7757	19.7648	19.5413	19.0870	18.5462	18.0907	(90)
Living area fraction										fLA = Living area / (4) =		0.3475	(91)
MIT	18.4125	18.5791	18.8567	19.2733	19.6599	19.9741	20.1248	20.1097	19.8732	19.4145	18.8735	18.4198	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4125	18.5791	18.8567	19.2733	19.6599	19.9741	20.1248	20.1097	19.8732	19.4145	18.8735	18.4198	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9708	0.9576	0.9275	0.8674	0.7675	0.6100	0.6466	0.8301	0.9277	0.9682	0.9813	(94)
Useful gains	400.0361	438.1505	452.5942	457.8005	434.2474	350.0854	267.5157	273.3745	340.7087	388.0315	387.2498	387.3384	(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	1290.0203	1244.7964	1119.4905	920.2114	703.3049	465.9964	305.6408	320.5461	504.2641	778.8113	1048.6758	1277.1951	(97)
Space heating kWh	662.1482	542.0660	496.1708	332.9359	200.1788	0.0000	0.0000	0.0000	0.0000	290.7402	476.2267	662.0534	(98a)
Space heating requirement - total per year (kWh/year)												3662.5200	
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	662.1482	542.0660	496.1708	332.9359	200.1788	0.0000	0.0000	0.0000	0.0000	290.7402	476.2267	662.0534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3662.5200	
Space heating per m2											(98c) / (4) =	90.6564	(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 %)	84.5000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	662.1482	542.0660	496.1708	332.9359	200.1788	0.0000	0.0000	0.0000	0.0000	290.7402	476.2267	662.0534	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	783.6074	641.4983	587.1844	394.0070	236.8980	0.0000	0.0000	0.0000	0.0000	344.0713	563.5819	783.4951	(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	234.8532	208.4950	223.0623	199.3464	195.5448	148.0912	146.3014	151.8306	153.2103	202.0330	211.3508	232.6671	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month	277.9327	246.7396	263.9790	235.9129	231.4139	175.2558	173.1377	179.6811	181.3139	239.0923	250.1192	275.3457	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	12.2369	9.8169	8.8390	6.4759	5.0021	4.0868	4.5631	5.9313	7.7042	10.1083	11.4173	12.5770	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4334.3432	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2729.9240	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	98.7588	(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	7249.0261	(238)

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

	Energy	Emission factor	Emissions

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	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	4334.3432	0.2100	910.2121	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2729.9240	0.2100	573.2840	(264)
Space and water heating			1483.4961	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	98.7588	0.1443	14.2539	(268)
Total CO2, kg/year			1509.6793	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			37.3700	(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	4334.3432	1.1300	4897.8079	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2729.9240	1.1300	3084.8141	(278)
Space and water heating			7982.6220	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	98.7588	1.5338	151.4796	(282)
Total Primary energy kWh/year			8264.2023	(286)
Dwelling Primary energy Rate (DPER)			204.5600	(287)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		40.4000	(1b)	x 3.1000	(2b) =	125.2400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2400	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1597	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4097	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3482	(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	0.4440	0.4353	0.4266	0.3831	0.3744	0.3308	0.3308	0.3221	0.3482	0.3744	0.3918	0.4092	(22b)
Effective ac	0.5986	0.5947	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5767	0.5837	(25)

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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 Opening Type			6.2200	1.1450	7.1221			(27)
Ext Wall 1	29.2600	5.2300	24.0300	0.1800	4.3254			(29a)
Ext Wall 2	3.4700	0.9900	2.4800	0.1800	0.4464			(29a)
Ext Wall 3	8.6800		8.6800	0.1800	1.5624			(29a)
External Roof 1	39.3900		39.3900	0.1100	4.3329			(30)
Total net area of external elements Aum(A, m2)			80.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.7892			(33)
Main dwelling								
Party Wall 1			35.6200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	4.0400	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	21.8292	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7384	24.5802	24.4252	23.6969	23.5606	22.9263	22.9263	22.8088	23.1706	23.5606	23.8363	24.1245	(38)

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elmhurst energy

Heat transfer coeff

	46.5677	46.4095	46.2544	45.5261	45.3898	44.7555	44.7555	44.6380	44.9998	45.3898	45.6655	45.9537 (39)
Average = Sum(39)m / 12 =												45.5255

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1527	1.1487	1.1449	1.1269	1.1235	1.1078	1.1078	1.1049	1.1139	1.1235	1.1303	1.1375	(40)
HLP (average)												1.1269	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4170 (42)

Hot water usage for mixer showers

	61.5485	60.6235	59.2757	56.6968	54.7937	52.6714	51.4650	52.8027	54.2690	56.5477	59.1819	61.3126 (42a)

Hot water usage for baths

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)

Hot water usage for other uses

	29.1416	28.0819	27.0222	25.9625	24.9028	23.8431	23.8431	24.9028	25.9625	27.0222	28.0819	29.1416 (42c)

Average daily hot water use (litres/day) 83.2380 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	90.6900	88.7054	86.2979	82.6593	79.6965	76.5145	75.3081	77.7054	80.2314	83.5699	87.2638	90.4542	(44)
Energy conte	143.6309	126.3153	132.6366	113.1565	107.2868	94.0835	91.0786	96.2156	98.9334	113.4036	124.3233	141.6295	(45)
Energy content (annual)										Total = Sum(45)m =		1382.6934	
Distribution loss (46)m = 0.15 x (45)m													
	21.5446	18.9473	19.8955	16.9735	16.0930	14.1125	13.6618	14.4323	14.8400	17.0105	18.6485	21.2444	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	190.2258	168.4010	179.2315	158.2483	153.8817	139.1753	137.6735	142.8105	144.0252	159.9985	169.4152	188.2244	(62)
WWHRS	-28.1374	-24.8849	-26.0581	-21.5771	-20.1091	-17.2075	-16.1293	-17.1519	-17.8035	-20.9884	-23.7773	-27.6163	(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

	162.0884	143.5161	153.1734	136.6712	133.7726	121.9678	121.5443	125.6586	126.2217	139.0101	145.6378	160.6080	(64)
										Total per year (kWh/year) = Sum(64)m =		1669.8700	(64)
12Total per year (kWh/year)												1670	(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

	85.0332	75.6684	81.3776	73.6980	72.9488	67.3562	67.5596	69.2676	68.9688	74.9826	77.4110	84.3677	(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	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	64.9845	71.9471	64.9845	67.1506	64.9845	67.1506	64.9845	64.9845	67.1506	64.9845	67.1506	64.9845	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	122.5407	123.8123	120.6080	113.7862	105.1751	97.0818	91.6749	90.4034	93.6077	100.4294	109.0406	117.1339	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	(71)
Water heating gains (Table 5)													
	114.2919	112.6018	109.3785	102.3583	98.0494	93.5503	90.8059	93.1016	95.7900	100.7831	107.5152	113.3975	(72)
Total internal gains													
	349.0722	355.6163	342.2260	330.5503	315.4641	302.0378	291.7204	292.7445	300.8035	313.4521	330.9616	342.7709	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.9900	11.2829	0.6300	0.7000	0.7700	3.4137	(75)
Southeast	5.2300	36.7938	0.6300	0.7000	0.7700	58.8096	(77)

Solar gains	62.2234	107.1233	149.5827	190.3885	217.8589	218.3103	209.6309	188.8269	163.6656	119.2062	74.7358	53.1166	(83)
Total gains	411.2956	462.7396	491.8087	520.9388	533.3229	520.3481	501.3513	481.5715	464.4691	432.6582	405.6973	395.8876	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.2469	60.4522	60.6549	61.6252	61.8102	62.6863	62.6863	62.8512	62.3459	61.8102	61.4371	61.0518	
alpha	5.0165	5.0301	5.0437	5.1083	5.1207	5.1791	5.1791	5.1901	5.1564	5.1207	5.0958	5.0701	
util living area													
	0.9803	0.9638	0.9341	0.8587	0.7260	0.5389	0.3909	0.4234	0.6382	0.8708	0.9606	0.9832	(86)
MIT	20.0068	20.2006	20.4389	20.7242	20.9069	20.9840	20.9975	20.9962	20.9624	20.7459	20.3474	19.9820	(87)
Th 2	19.9581	19.9612	19.9643	19.9789	19.9817	19.9945	19.9945	19.9968	19.9895	19.9817	19.9761	19.9704	(88)

util rest of house													
	0.9745	0.9537	0.9159	0.8225	0.6655	0.4593	0.3026	0.3327	0.5566	0.8299	0.9478	0.9783	(89)
MIT 2	18.8407	19.0837	19.3770	19.7194	19.9099	19.9861	19.9937	19.9956	19.9672	19.7532	19.2808	18.8189	(90)
Living area fraction										fLA = Living area / (4) =		0.3475	(91)
MIT	19.2459	19.4719	19.7460	20.0686	20.2564	20.3329	20.3425	20.3433	20.3131	20.0982	19.6515	19.2231	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2459	19.4719	19.7460	20.0686	20.2564	20.3329	20.3425	20.3433	20.3131	20.0982	19.6515	19.2231	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9695	0.9479	0.9114	0.8260	0.6827	0.4866	0.3333	0.3643	0.5837	0.8351	0.9428	0.9737	(94)
Useful gains	398.7456	438.6266	448.2358	430.2884	364.0831	253.1940	167.1173	175.4198	271.0892	361.3251	382.5014	385.4600	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	695.9970	676.2726	612.6864	508.4611	388.3737	256.5771	167.4993	176.0228	279.5868	431.1223	573.1704	690.3677	(97)
Space heating kWh	221.1551	159.6981	122.3513	56.2843	18.0722	0.0000	0.0000	0.0000	0.0000	51.9291	137.2817	226.8513	(98a)
Space heating requirement - total per year (kWh/year)												993.6230	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1551	159.6981	122.3513	56.2843	18.0722	0.0000	0.0000	0.0000	0.0000	51.9291	137.2817	226.8513	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												993.6230	
Space heating per m2											(98c) / (4) =	24.5946	(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	221.1551	159.6981	122.3513	56.2843	18.0722	0.0000	0.0000	0.0000	0.0000	51.9291	137.2817	226.8513	(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)	239.6046	173.0207	132.5582	60.9798	19.5798	0.0000	0.0000	0.0000	0.0000	56.2612	148.7342	245.7761	(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	162.0884	143.5161	153.1734	136.6712	133.7726	121.9678	121.5443	125.6586	126.2217	139.0101	145.6378	160.6080	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7571	84.2999	83.5608	82.2311	80.7743	79.8000	79.8000	79.8000	79.8000	82.0620	83.9275	84.8340	(217)
Fuel for water heating, kWh/month	191.2387	170.2446	183.3078	166.2039	165.6128	152.8419	152.3111	157.4669	158.1726	169.3964	173.5282	189.3203	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.5025	10.8322	9.7532	7.1456	5.5195	4.5095	5.0350	6.5447	8.5010	11.1537	12.5981	13.8778	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0398	-20.5907	-30.7891	-36.0835	-40.2252	-38.0724	-37.6524	-34.9177	-30.2785	-24.2347	-15.7318	-12.0503	(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	-5.6780	-12.1474	-24.5103	-37.3372	-49.8579	-50.2330	-49.5967	-41.7316	-30.2755	-17.4942	-7.6242	-4.4717	(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	1076.5147	(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	2029.6450	(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)	108.9728	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-665.6238	(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	2635.5087	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year

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Space heating - main system 1	1076.5147	0.2100	226.0681	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2029.6450	0.2100	426.2255	(264)
Space and water heating			652.2935	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	108.9728	0.1443	15.7281	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-334.6661	0.1337	-44.7519	
PV Unit electricity exported	-330.9576	0.1255	-41.5370	
Total			-86.2889	(269)
Total CO2, kg/year			593.6621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1076.5147	1.1300	1216.4616	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2029.6450	1.1300	2293.4989	(278)
Space and water heating			3509.9605	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	108.9728	1.5338	167.1461	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-334.6661	1.4942	-500.0450	
PV Unit electricity exported	-330.9576	0.4607	-152.4639	
Total			-652.5089	(283)
Total Primary energy kWh/year			3154.6985	(286)
Target Primary Energy Rate (TPER)			78.0900	(287)

BASELINE

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elmhurst energy

Property Reference	Flat 07 - 1B1P	Issued on Date	20/08/2025
Assessment Reference	00001	Prop Type Ref	
Property	Wells Road		

SAP Rating	74 C	DER	37.76	TER	13.24
Environmental	77 C	% DER < TER			-185.20
CO_2 Emissions (t/year)	1.37	DFEE	93.58	TFEE	25.71
Compliance Check	See BREL	% DFEE < TFEE			-264.00
% DPER < TPER	-193.48	DPER	206.85	TPER	70.48

Assessor Details	[redacted]	Assessor ID	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.7800	(1b)	x 3.1000	(2b) =	123.3180	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.7800					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	123.3180	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1622	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6622	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5132	(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	0.6543	0.6415	0.6287	0.5645	0.5517	0.4875	0.4875	0.4747	0.5132	0.5517	0.5773	0.6030	(22b)
Effective ac	0.7141	0.7058	0.6976	0.6593	0.6522	0.6188	0.6188	0.6127	0.6317	0.6522	0.6667	0.6818	(25)

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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								
Ext Glazing - Resi New			3.9200	1.5038	5.8947			(27)
Ext Wall 1	19.7500	3.9200	15.8300	0.3000	4.7490			(29a)
External Roof 1	39.3900		39.3900	0.1600	6.3024			(30)
Total net area of external elements Aum(A, m2)			59.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.5961			(33)
Main dwelling								
Party Wall 1			59.3000	0.5000	29.6500			(32)
Party Floor 1			39.3900					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	11.8280	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	58.4241	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0589	28.7206	28.3890	26.8316	26.5403	25.1838	25.1838	24.9326	25.7063	26.5403	27.1297	27.7460	(38)
Heat transfer coeff	87.4830	87.1448	86.8132	85.2558	84.9644	83.6079	83.6079	83.3567	84.1304	84.9644	85.5539	86.1701	(39)
Average = Sum(39)m / 12 =												85.2544	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1992	2.1907	2.1823	2.1432	2.1359	2.1018	2.1018	2.0954	2.1149	2.1359	2.1507	2.1662	(40)
HLP (average)												2.1431	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4005	(42)
Hot water usage for mixer showers													
	68.8407	67.8062	66.2986	63.4142	61.2856	58.9118	57.5626	59.0587	60.6987	63.2475	66.1938	68.5770	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	28.9725	27.9190	26.8654	25.8119	24.7583	23.7048	23.7048	24.7583	25.8119	26.8654	27.9190	28.9725	(42c)
Average daily hot water use (litres/day)												89.8075	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	97.8132	95.7251	93.1641	89.2261	86.0440	82.6166	81.2674	83.8170	86.5106	90.1129	94.1128	97.5495	(44)
Energy conte	154.9123	136.3113	143.1897	122.1461	115.8317	101.5868	98.2858	103.7830	106.6762	122.2823	134.0809	152.7389	(45)
Energy content (annual)										Total = Sum(45)m =		1491.8252	
Distribution loss (46)m = 0.15 x (45)m													
	23.2368	20.4467	21.4785	18.3219	17.3748	15.2380	14.7429	15.5674	16.0014	18.3424	20.1121	22.9108	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	233.9499	207.7001	222.2273	198.6341	194.8693	147.4988	145.7282	151.2254	152.5882	201.3199	210.5689	231.7765	(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													
	233.9499	207.7001	222.2273	198.6341	194.8693	147.4988	145.7282	151.2254	152.5882	201.3199	210.5689	231.7765	(64)
										Total per year (kWh/year) = Sum(64)m =		2298.0868	(64)
12Total per year (kWh/year)												2298	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.3944	84.9626	91.4967	83.0840	82.4001	51.7872	51.2900	53.1178	53.4794	84.5450	87.0523	94.6718	(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	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	66.9201	74.0901	66.9201	69.1508	66.9201	69.1508	66.9201	66.9201	69.1508	66.9201	69.1508	66.9201	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	120.9805	122.2359	119.0723	112.3375	103.8359	95.8457	90.5077	89.2523	92.4159	99.1507	107.6523	115.6425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	(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)													
	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	(71)
Water heating gains (Table 5)													
	128.2183	126.4324	122.9794	115.3944	110.7529	71.9267	68.9381	71.3948	74.2770	113.6357	120.9060	127.2470	(72)
Total internal gains													
	360.1264	366.7659	352.9793	340.8902	325.5164	280.9307	270.3735	271.5748	279.8512	323.7141	341.7166	353.8172	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.9200	36.7938	0.4000	0.9000	0.7700	35.9830	(79)

Solar gains	35.9830	61.2923	83.8628	103.9100	116.3879	115.5463	111.3989	102.0899	90.8057	67.7410	43.0993	30.7939	(83)
Total gains	396.1094	428.0582	436.8421	444.8003	441.9044	396.4769	381.7724	373.6647	370.6568	391.4551	384.8158	384.6111	(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	31.5776	31.7001	31.8212	32.4025	32.5136	33.0411	33.0411	33.1407	32.8359	32.5136	32.2896	32.0587	
alpha	3.1052	3.1133	3.1214	3.1602	3.1676	3.2027	3.2027	3.2094	3.1891	3.1676	3.1526	3.1372	
util living area													
	0.9873	0.9826	0.9757	0.9589	0.9232	0.8616	0.7477	0.7722	0.8980	0.9563	0.9805	0.9885	(86)
MIT	19.0856	19.2322	19.4852	19.8672	20.2481	20.5707	20.7620	20.7406	20.4779	20.0303	19.5146	19.0815	(87)
Th 2	19.9004	19.9047	19.9088	19.9284	19.9321	19.9491	19.9491	19.9523	19.9426	19.9321	19.9247	19.9169	(88)
util rest of house													
	0.9847	0.9790	0.9702	0.9482	0.8991	0.8058	0.6340	0.6676	0.8558	0.9429	0.9758	0.9861	(89)
MIT 2	18.1475	18.2964	18.5511	18.9438	19.3174	19.6330	19.7877	19.7760	19.5465	19.1089	18.5934	18.1561	(90)
Living area fraction										fLA = Living area / (4) =		0.5040	(91)

MIT	18.6203	18.7680	19.0219	19.4092	19.7865	20.1056	20.2788	20.2622	20.0159	19.5733	19.0577	18.6225 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6203	18.7680	19.0219	19.4092	19.7865	20.1056	20.2788	20.2622	20.0159	19.5733	19.0577	18.6225 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9741	0.9644	0.9418	0.8952	0.8155	0.6743	0.7029	0.8594	0.9372	0.9709	0.9824	(94)
Useful gains	388.4562	416.9825	421.2994	418.8966	395.5788	323.3364	257.4405	262.6427	318.5283	366.8714	373.6173	377.8570	(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	1252.7873	1208.5256	1087.0644	895.9696	687.0649	460.3156	307.5764	321.9383	497.7098	762.4116	1023.0300	1242.7909	(97)
Space heating kWh	643.0623	531.9170	495.3292	343.4925	216.8657	0.0000	0.0000	0.0000	0.0000	294.2818	467.5772	643.5108	(98a)
Space heating requirement - total per year (kWh/year)												3636.0365	
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	643.0623	531.9170	495.3292	343.4925	216.8657	0.0000	0.0000	0.0000	0.0000	294.2818	467.5772	643.5108	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3636.0365	
Space heating per m2											(98c) / (4) =	91.4036	(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 %)	84.5000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	643.0623	531.9170	495.3292	343.4925	216.8657	0.0000	0.0000	0.0000	0.0000	294.2818	467.5772	643.5108	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	761.0204	629.4876	586.1884	406.5001	256.6458	0.0000	0.0000	0.0000	0.0000	348.2625	553.3457	761.5513	(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	233.9499	207.7001	222.2273	198.6341	194.8693	147.4988	145.7282	151.2254	152.5882	201.3199	210.5689	231.7765	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month	276.8637	245.7990	262.9909	235.0700	230.6146	174.5548	172.4595	178.9650	180.5778	238.2485	249.1940	274.2917	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.1418	10.5429	9.4927	6.9547	5.3720	4.3890	4.9006	6.3699	8.2739	10.8558	12.2616	13.5071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4303.0018	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2719.6293	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	106.0620	(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	7214.6931	(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	4303.0018	0.2100	903.6304	(261)
Total CO2 associated with community systems			0.0000	(373)

Water heating (other fuel)	2719.6293	0.2100	571.1222	(264)
Space and water heating			1474.7525	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	106.0620	0.1443	15.3080	(268)
Total CO2, kg/year			1501.9898	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			37.7600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4303.0018	1.1300	4862.3920	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2719.6293	1.1300	3073.1811	(278)
Space and water heating			7935.5732	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	106.0620	1.5338	162.6814	(282)
Total Primary energy kWh/year			8228.3554	(286)
Dwelling Primary energy Rate (DPER)			206.8500	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.7800	(1b)	x 3.1000	(2b) =	123.3180	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	123.3180	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1622	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4122	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3194	(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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3194	0.3434	0.3594	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704	(25)

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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 Opening Type			3.9200	1.1450	4.4885			(27)
Ext Wall 1	19.7500	3.9200	15.8300	0.1800	2.8494			(29a)
External Roof 1	39.3900		39.3900	0.1100	4.3329			(30)
Total net area of external elements Aum(A, m2)			59.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.6708			(33)
Main dwelling								
Party Wall 1			59.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	2.9570	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	14.6278	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.7228	23.5917	23.4632	22.8598	22.7469	22.2213	22.2213	22.1240	22.4238	22.7469	22.9753	23.2141	(38)
Heat transfer coeff	38.3506	38.2196	38.0911	37.4877	37.3748	36.8492	36.8492	36.7519	37.0516	37.3748	37.6032	37.8419	(39)
Average = Sum(39)m / 12 =												37.4871	

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

Full SAP Calculation Printout

elmhurst energy

HLP	0.9641	0.9608	0.9575	0.9424	0.9395	0.9263	0.9263	0.9239	0.9314	0.9395	0.9453	0.9513 (40)
HLP (average)												0.9424
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4005 (42)
Hot water usage for mixer showers												
	61.1917	60.2721	58.9321	56.3682	54.4761	52.3661	51.1667	52.4966	53.9544	56.2200	58.8389	60.9573 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	28.9725	27.9190	26.8654	25.8119	24.7583	23.7048	23.7048	24.7583	25.8119	26.8654	27.9190	28.9725 (42c)
Average daily hot water use (litres/day)												82.7554 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	90.1643	88.1911	85.7976	82.1801	79.2345	76.0709	74.8715	77.2550	79.7663	83.0854	86.7579	89.9298	(44)
Energy conte	142.7982	125.5830	131.8676	112.5005	106.6648	93.5380	90.5506	95.6578	98.3598	112.7461	123.6026	140.8084	(45)
Energy content (annual)											Total = Sum(45)m =	1374.6773	
Distribution loss (46)m = 0.15 x (45)m													
	21.4197	18.8374	19.7801	16.8751	15.9997	14.0307	13.5826	14.3487	14.7540	16.9119	18.5404	21.1213	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	189.3931	167.6687	178.4625	157.5923	153.2597	138.6299	137.1455	142.2527	143.4517	159.3410	168.6944	187.4033	(62)
WWHRS	-27.9743	-24.7407	-25.9070	-21.4521	-19.9925	-17.1078	-16.0358	-17.0525	-17.7004	-20.8668	-23.6395	-27.4563	(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													
	161.4188	142.9280	152.5555	136.1402	133.2672	121.5221	121.1097	125.2002	125.7513	138.4742	145.0549	159.9470	(64)
										Total per year (kWh/year) = Sum(64)m =		1663.3692	(64)
12Total per year (kWh/year)												1663	(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													
	84.7563	75.4249	81.1219	73.4799	72.7420	67.1749	67.3840	69.0821	68.7781	74.7640	77.1713	84.0947	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	70.6795	78.2523	70.6795	73.0354	70.6795	73.0354	70.6795	70.6795	73.0354	70.6795	73.0354	70.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	120.9805	122.2359	119.0723	112.3375	103.8359	95.8457	90.5077	89.2523	92.4159	99.1507	107.6523	115.6425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	(71)
Water heating gains (Table 5)													
	113.9198	112.2395	109.0348	102.0554	97.7715	93.2984	90.5699	92.8523	95.5252	100.4892	107.1824	113.0305	(72)
Total internal gains													
	352.5873	359.7351	345.7941	334.4358	319.2944	306.1871	295.7646	296.7916	304.9840	317.3269	334.8776	346.3600	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.9200	36.7938	0.6300	0.7000	0.7700	44.0791	(79)

Solar gains	44.0791	75.0831	102.7319	127.2898	142.5752	141.5442	136.4637	125.0601	111.2369	82.9828	52.7966	37.7225	(83)
Total gains	396.6664	434.8182	448.5260	461.7256	461.8696	447.7312	432.2283	421.8517	416.2209	400.3097	387.6743	384.0826	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.0327	72.2798	72.5235	73.6909	73.9135	74.9677	74.9677	75.1663	74.5581	73.9135	73.4646	73.0010
alpha	5.8022	5.8187	5.8349	5.9127	5.9276	5.9978	5.9978	6.0111	5.9705	5.9276	5.8976	5.8667
util living area												
	0.9754	0.9571	0.9265	0.8476	0.7124	0.5213	0.3745	0.3998	0.6009	0.8428	0.9492	0.9787 (86)
MIT	20.2928	20.4441	20.6181	20.8257	20.9481	20.9932	20.9992	20.9988	20.9844	20.8562	20.5670	20.2735 (87)
Th 2	20.1134	20.1162	20.1189	20.1316	20.1340	20.1452	20.1452	20.1473	20.1409	20.1340	20.1292	20.1241 (88)
util rest of house												
	0.9688	0.9461	0.9080	0.8131	0.6583	0.4541	0.3021	0.3262	0.5315	0.8015	0.9345	0.9730 (89)
MIT 2	19.3183	19.5067	19.7194	19.9677	20.0938	20.1415	20.1449	20.1469	20.1316	20.0064	19.6707	19.3029 (90)
Living area fraction										fLA = Living area / (4) =		0.5040 (91)
MIT	19.8095	19.9792	20.1723	20.4002	20.5244	20.5708	20.5755	20.5763	20.5614	20.4347	20.1224	19.7921 (92)
Temperature adjustment												0.0000

adjusted MIT	19.8095	19.9792	20.1723	20.4002	20.5244	20.5708	20.5755	20.5763	20.5614	20.4347	20.1224	19.7921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9442	0.9093	0.8244	0.6834	0.4879	0.3386	0.3633	0.5660	0.8167	0.9344	0.9703	(94)
Useful gains	383.2179	410.5391	407.8373	380.6608	315.6216	218.4302	146.3469	153.2614	235.5817	326.9481	362.2296	372.6844	(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	594.7977	576.3198	520.7945	431.1144	329.8082	220.0194	146.4941	153.4856	239.4061	367.5700	489.6839	590.0358	(97)
Space heating kWh	157.4154	111.4046	84.0402	36.3266	10.5548	0.0000	0.0000	0.0000	0.0000	30.2227	91.7671	161.7094	(98a)
Space heating requirement - total per year (kWh/year)												683.4409	
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	157.4154	111.4046	84.0402	36.3266	10.5548	0.0000	0.0000	0.0000	0.0000	30.2227	91.7671	161.7094	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												683.4409	
Space heating per m2											(98c) / (4) =	17.1805	(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	157.4154	111.4046	84.0402	36.3266	10.5548	0.0000	0.0000	0.0000	0.0000	30.2227	91.7671	161.7094	(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)	170.5475	120.6984	91.0511	39.3571	11.4354	0.0000	0.0000	0.0000	0.0000	32.7440	99.4226	175.1998	(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	161.4188	142.9280	152.5555	136.1402	133.2672	121.5221	121.1097	125.2002	125.7513	138.4742	145.0549	159.9470	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0035	83.5073	82.7801	81.5407	80.3980	79.8000	79.8000	79.8000	79.8000	81.2758	83.0621	84.0844	(217)
Fuel for water heating, kWh/month	192.1572	171.1563	184.2900	166.9599	165.7593	152.2833	151.7666	156.8925	157.5831	170.3758	174.6343	190.2220	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.6858	11.7815	10.6079	7.7718	6.0032	4.9046	5.4763	7.1183	9.2460	12.1312	13.7022	15.0940	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.8532	-20.3282	-30.4081	-35.6462	-39.7422	-37.6169	-37.2102	-34.5157	-29.9306	-23.9431	-15.5298	-11.8894	(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	-5.5621	-11.9074	-24.0426	-36.6477	-48.9585	-49.3333	-48.6999	-40.9573	-29.6941	-17.1454	-7.4677	-4.3791	(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	740.4560	(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	2034.0803	(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)	118.5228	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-655.4087	(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	2323.6504	(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	740.4560	0.2100	155.4958	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2034.0803	0.2100	427.1569	(264)
Space and water heating			582.6526	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	118.5228	0.1443	17.1065	(268)

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Energy saving/generation technologies				
PV Unit electricity used in dwelling	-330.6137	0.1337	-44.2073	
PV Unit electricity exported	-324.7950	0.1255	-40.7587	
Total			-84.9660	(269)
Total CO2, kg/year			526.7224	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2400	(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	740.4560	1.1300	836.7153	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2034.0803	1.1300	2298.5108	(278)
Space and water heating			3135.2261	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	118.5228	1.5338	181.7942	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-330.6137	1.4941	-493.9799	
PV Unit electricity exported	-324.7950	0.4606	-149.6068	
Total			-643.5867	(283)
Total Primary energy kWh/year			2803.5344	(286)
Target Primary Energy Rate (TPER)			70.4800	(287)

BASELINE

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Property Reference	Flat 08 - 1B1P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	74 C	**DER**	35.81	**TER**	11.49
Environmental	75 C	**% DER < TER**			-211.66
CO_2 Emissions (t/year)	1.6	**DFEE**	91.93	**TFEE**	23.39
Compliance Check	See BREL	**% DFEE < TFEE**			-292.98
% DPER < TPER	-221.67	**DPER**	196.15	**TPER**	60.98

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	48.7700	(1b)	x 3.1000	(2b) =	151.1870	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.7700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	151.1870	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1323 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			10.0000 (17)
Infiltration rate			0.6323 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.4900 (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	0.6248	0.6125	0.6003	0.5390	0.5268	0.4655	0.4655	0.4533	0.4900	0.5268	0.5513	0.5758	(22b)
Effective ac	0.6952	0.6876	0.6802	0.6453	0.6387	0.6084	0.6084	0.6027	0.6201	0.6387	0.6520	0.6658	(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								
Ext Glazing - Resi New			3.3000	1.5038	4.9624			(27)
Ext Wall 1	15.7500	3.3000	12.4500	0.3000	3.7350			(29a)
External Roof 1	48.7700		48.7700	0.1600	7.8032			(30)
Total net area of external elements Aum(A, m2)			64.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.5206			(33)
Main dwelling								
Party Wall 1			80.0400	0.5000	40.0200			(32)
Party Floor 1			48.7700					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	12.9040	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	69.4246	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6834	34.3053	33.9347	32.1938	31.8681	30.3519	30.3519	30.0711	30.9359	31.8681	32.5270	33.2159	(38)
Heat transfer coeff	104.1080	103.7299	103.3593	101.6184	101.2927	99.7765	99.7765	99.4957	100.3605	101.2927	101.9516	102.6405	(39)
Average = Sum(39)m / 12 =												101.6168	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1347	2.1269	2.1193	2.0836	2.0769	2.0459	2.0459	2.0401	2.0578	2.0769	2.0905	2.1046	(40)
HLP (average)												2.0836	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6540	(42)
Hot water usage for mixer showers													
	75.0027	73.8756	72.2331	69.0905	66.7714	64.1851	62.7150	64.3451	66.1319	68.9088	72.1189	74.7153	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	31.5681	30.4202	29.2723	28.1243	26.9764	25.8285	25.8285	26.9764	28.1243	29.2723	30.4202	31.5681	(42c)
Average daily hot water use (litres/day)												97.8483	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	106.5708	104.2958	101.5054	97.2149	93.7478	90.0136	88.5435	91.3215	94.2563	98.1811	102.5391	106.2835	(44)
Energy conte	168.7822	148.5158	156.0100	133.0823	126.2025	110.6822	107.0857	113.0751	116.2274	133.2308	146.0857	166.4142	(45)
Energy content (annual)										Total = Sum(45)m =		1625.3938	
Distribution loss (46)m = 0.15 x (45)m													
	25.3173	22.2774	23.4015	19.9623	18.9304	16.6023	16.0629	16.9613	17.4341	19.9846	21.9129	24.9621	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	247.8198	219.9046	235.0476	209.5703	205.2401	156.5942	154.5281	160.5175	162.1394	212.2684	222.5737	245.4518	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	247.8198	219.9046	235.0476	209.5703	205.2401	156.5942	154.5281	160.5175	162.1394	212.2684	222.5737	245.4518	(64)
										Total per year (kWh/year) = Sum(64)m =		2431.6554	(64)
12Total per year (kWh/year)												2432	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	100.0061	89.0205	95.7594	86.7203	85.8484	54.8114	54.2159	56.2074	56.6552	88.1853	91.0439	99.2188	(65)

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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	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	86.3034	95.5502	86.3034	89.1801	86.3034	89.1801	86.3034	86.3034	89.1801	86.3034	89.1801	86.3034	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.0398	145.5345	141.7680	133.7494	123.6274	114.1142	107.7588	106.2641	110.0307	118.0492	128.1712	137.6844	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	(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)													
	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	(71)
Water heating gains (Table 5)													
	134.4169	132.4710	128.7089	120.4448	115.3877	76.1270	72.8709	75.5476	78.6878	118.5287	126.4499	133.3586	(72)
Total internal gains													
	412.5694	421.3650	404.5895	391.1837	373.1278	327.2307	314.7423	315.9244	325.7079	370.6905	391.6105	405.1557	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.3000	36.7938	0.4000	0.9000	0.7700	30.2918	(79)

Solar gains	30.2918	51.5981	70.5988	87.4753	97.9796	97.2711	93.7797	85.9430	76.4435	57.0269	36.2826	25.9234	(83)
Total gains	442.8611	472.9631	475.1883	478.6590	471.1074	424.5017	408.5220	401.8674	402.1514	427.7174	427.8931	431.0791	(84)

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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	32.5317	32.6502	32.7673	33.3287	33.4358	33.9439	33.9439	34.0397	33.7464	33.4358	33.2197	32.9968	
alpha	3.1688	3.1767	3.1845	3.2219	3.2291	3.2629	3.2629	3.2693	3.2498	3.2291	3.2146	3.1998	
util living area													
	0.9902	0.9869	0.9822	0.9702	0.9436	0.8927	0.7922	0.8129	0.9204	0.9669	0.9850	0.9911	(86)
MIT	19.0857	19.2192	19.4575	19.8265	20.2031	20.5378	20.7422	20.7201	20.4494	20.0023	19.5031	19.0823	(87)
Th 2	19.9327	19.9365	19.9403	19.9582	19.9615	19.9771	19.9771	19.9799	19.9711	19.9615	19.9548	19.9477	(88)
util rest of house													
	0.9882	0.9842	0.9781	0.9623	0.9250	0.8460	0.6872	0.7177	0.8857	0.9565	0.9814	0.9893	(89)
MIT 2	18.1724	18.3083	18.5486	18.9285	19.3007	19.6314	19.8031	19.7897	19.5468	19.1059	18.6056	18.1806	(90)
Living area fraction										fLA = Living area / (4) =		0.4132	(91)

MIT	18.5498	18.6847	18.9241	19.2995	19.6735	20.0059	20.1911	20.1741	19.9197	19.4763	18.9764	18.5531 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5498	18.6847	18.9241	19.2995	19.6735	20.0059	20.1911	20.1741	19.9197	19.4763	18.9764	18.5531 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9799	0.9730	0.9558	0.9186	0.8476	0.7130	0.7392	0.8835	0.9502	0.9769	0.9861	(94)
Useful gains	436.0782	463.4486	462.3618	457.5013	432.7482	359.8163	291.2745	297.0445	355.3138	406.4339	418.0023	425.0680	(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													
	1483.5152	1429.8848	1284.1508	1056.7791	807.6608	539.3818	358.3078	375.5068	584.0675	899.0999	1210.8189	1473.2139	(97)
Space heating kWh													
	779.2932	649.4451	611.4110	431.4800	278.9350	0.0000	0.0000	0.0000	0.0000	366.5435	570.8279	779.8206	(98a)
Space heating requirement - total per year (kWh/year)												4467.7563	
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													
	779.2932	649.4451	611.4110	431.4800	278.9350	0.0000	0.0000	0.0000	0.0000	366.5435	570.8279	779.8206	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4467.7563	
Space heating per m2											(98c) / (4) =	91.6087	(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 %)												84.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	779.2932	649.4451	611.4110	431.4800	278.9350	0.0000	0.0000	0.0000	0.0000	366.5435	570.8279	779.8206	(98)
Space heating efficiency (main heating system 1)													
	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)													
	922.2404	768.5741	723.5633	510.6272	330.1006	0.0000	0.0000	0.0000	0.0000	433.7793	675.5360	922.8646	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	247.8198	219.9046	235.0476	209.5703	205.2401	156.5942	154.5281	160.5175	162.1394	212.2684	222.5737	245.4518	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month													
	293.2778	260.2421	278.1628	248.0122	242.8877	185.3186	182.8735	189.9615	191.8809	251.2052	263.4008	290.4755	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.9483	13.5966	12.2422	8.9692	6.9280	5.6603	6.3200	8.2150	10.6704	14.0002	15.8132	17.4194	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	5287.2856	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2877.6987	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	136.7826	(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	8387.7669	(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	5287.2856	0.2100	1110.3300	(261)
Total CO2 associated with community systems			0.0000	(373)

Water heating (other fuel)	2877.6987	0.2100	604.3167	(264)
Space and water heating			1714.6467	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.7826	0.1443	19.7419	(268)
Total CO2, kg/year			1746.3179	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			35.8100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5287.2856	1.1300	5974.6327	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2877.6987	1.1300	3251.7995	(278)
Space and water heating			9226.4323	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.7826	1.5338	209.8016	(282)
Total Primary energy kWh/year			9566.3347	(286)
Dwelling Primary energy Rate (DPER)			196.1500	(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	48.7700	(1b) x	3.1000	(2b) =	151.1870	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		151.1870	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1323	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3823	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2963	(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	0.3777	0.3703	0.3629	0.3259	0.3185	0.2815	0.2815	0.2741	0.2963	0.3185	0.3333	0.3481	(22b)
Effective ac	0.5713	0.5686	0.5659	0.5531	0.5507	0.5396	0.5396	0.5376	0.5439	0.5507	0.5555	0.5606	(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 Opening Type			3.3000	1.1450	3.7786			(27)
Ext Wall 1	15.7500	3.3000	12.4500	0.1800	2.2410			(29a)
External Roof 1	48.7700		48.7700	0.1100	5.3647			(30)
Total net area of external elements Aum(A, m2)			64.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.3843			(33)
Main dwelling								
Party Wall 1			80.0400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	3.2260	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	14.6103	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.5054	28.3672	28.2317	27.5954	27.4763	26.9220	26.9220	26.8194	27.1355	27.4763	27.7172	27.9690	(38)
Heat transfer coeff	43.1158	42.9775	42.8421	42.2057	42.0866	41.5324	41.5324	41.4297	41.7459	42.0866	42.3275	42.5793	(39)
Average = Sum(39)m / 12 =												42.2051	

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

Full SAP Calculation Printout

HLP	0.8841	0.8812	0.8785	0.8654	0.8630	0.8516	0.8516	0.8495	0.8560	0.8630	0.8679	0.8731	(40)
HLP (average)												0.8654	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6540	(42)
Hot water usage for mixer showers													
	66.6691	65.6672	64.2072	61.4138	59.3523	57.0534	55.7467	57.1956	58.7839	61.2523	64.1057	66.4136	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	31.5681	30.4202	29.2723	28.1243	26.9764	25.8285	25.8285	26.9764	28.1243	29.2723	30.4202	31.5681	(42c)
Average daily hot water use (litres/day)												90.1650	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	98.2372	96.0874	93.4795	89.5381	86.3287	82.8819	81.5752	84.1720	86.9083	90.5245	94.5259	97.9818	(44)
Energy conte	155.5837	136.8271	143.6744	122.5732	116.2151	101.9130	98.6581	104.2226	107.1666	122.8409	134.6694	153.4158	(45)
Energy content (annual)										Total = Sum(45)m =		1497.7600	
Distribution loss (46)m = 0.15 x (45)m													
	23.3376	20.5241	21.5512	18.3860	17.4323	15.2869	14.7987	15.6334	16.0750	18.4261	20.2004	23.0124	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	202.1786	178.9128	190.2693	167.6651	162.8100	147.0048	145.2530	150.8175	152.2584	169.4358	179.7613	200.0107	(62)
WWHRS	-30.4783	-26.9553	-28.2260	-23.3722	-21.7821	-18.6391	-17.4712	-18.5788	-19.2847	-22.7346	-25.7555	-29.9139	(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													
	171.7003	151.9576	162.0433	144.2928	141.0279	128.3657	127.7818	132.2386	132.9737	146.7013	154.0058	170.0968	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.1856	(64)
12Total per year (kWh/year)												1763	(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													
	89.0075	79.1636	85.0477	76.8291	75.9174	69.9595	70.0797	71.9299	71.7064	78.1205	80.8511	88.2867	(65)

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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	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	90.3200	99.9971	90.3200	93.3307	90.3200	93.3307	90.3200	90.3200	93.3307	90.3200	93.3307	90.3200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.0398	145.5345	141.7680	133.7494	123.6274	114.1142	107.7588	106.2641	110.0307	118.0492	128.1712	137.6844	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	(71)
Water heating gains (Table 5)													
	119.6337	117.8030	114.3114	106.7070	102.0396	97.1660	94.1932	96.6800	99.5922	105.0007	112.2931	118.6649	(72)
Total internal gains													
	404.8029	414.1439	397.2087	384.5964	366.7963	352.4202	340.0813	341.0734	350.7628	364.1792	384.6043	397.4786	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.3000	36.7938	0.6300	0.7000	0.7700	37.1074	(79)

Solar gains	37.1074	63.2077	86.4835	107.1572	120.0250	119.1571	114.8801	105.2802	93.6433	69.8579	44.4461	31.7562	(83)
Total gains	441.9103	477.3516	483.6921	491.7537	486.8213	471.5773	454.9614	446.3536	444.4061	434.0372	429.0504	429.2348	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5514	78.8041	79.0533	80.2452	80.4723	81.5462	81.5462	81.7482	81.1291	80.4723	80.0143	79.5411	
alpha	6.2368	6.2536	6.2702	6.3497	6.3648	6.4364	6.4364	6.4499	6.4086	6.3648	6.3343	6.3027	
util living area													
	0.9811	0.9674	0.9450	0.8797	0.7548	0.5574	0.4010	0.4260	0.6334	0.8678	0.9593	0.9836	(86)
MIT	20.3382	20.4681	20.6205	20.8190	20.9445	20.9932	20.9993	20.9989	20.9848	20.8584	20.5905	20.3215	(87)
Th 2	20.1811	20.1835	20.1859	20.1970	20.1991	20.2088	20.2088	20.2106	20.2051	20.1991	20.1949	20.1905	(88)
util rest of house													
	0.9759	0.9588	0.9305	0.8502	0.7042	0.4913	0.3293	0.3534	0.5664	0.8313	0.9473	0.9791	(89)
MIT 2	19.4298	19.5929	19.7815	20.0224	20.1548	20.2051	20.2086	20.2103	20.1957	20.0706	19.7554	19.4164	(90)
Living area fraction										fLA = Living area / (4) =		0.4132	(91)
MIT	19.8051	19.9545	20.1281	20.3515	20.4811	20.5307	20.5353	20.5361	20.5217	20.3961	20.1004	19.7903	(92)
Temperature adjustment												0.0000	

adjusted MIT	19.8051	19.9545	20.1281	20.3515	20.4811	20.5307	20.5353	20.5361	20.5217	20.3961	20.1004	19.7903	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9560	0.9293	0.8564	0.7227	0.5185	0.3589	0.3834	0.5936	0.8410	0.9457	0.9764	(94)
Useful gains	429.9830	456.3488	449.4910	421.1145	351.8278	244.5012	163.2975	171.1386	263.8113	365.0324	405.7530	419.0995	(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	668.5149	647.0034	583.8570	483.3195	369.5660	246.3152	163.4416	171.3585	268.0812	412.2861	550.2745	663.8261	(97)
Space heating kWh	177.4678	128.1199	99.9683	44.7876	13.1972	0.0000	0.0000	0.0000	0.0000	35.1568	104.0555	182.0766	(98a)
Space heating requirement - total per year (kWh/year)												784.8296	
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	177.4678	128.1199	99.9683	44.7876	13.1972	0.0000	0.0000	0.0000	0.0000	35.1568	104.0555	182.0766	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												784.8296	
Space heating per m2											(98c) / (4) =	16.0925	(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	177.4678	128.1199	99.9683	44.7876	13.1972	0.0000	0.0000	0.0000	0.0000	35.1568	104.0555	182.0766	(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)	192.2728	138.8081	108.3080	48.5239	14.2982	0.0000	0.0000	0.0000	0.0000	38.0897	112.7362	197.2661	(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	171.7003	151.9576	162.0433	144.2928	141.0279	128.3657	127.7818	132.2386	132.9737	146.7013	154.0058	170.0968	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1340	83.6796	83.0100	81.7629	80.4981	79.8000	79.8000	79.8000	79.8000	81.3948	83.2001	84.2127	(217)
Fuel for water heating, kWh/month	204.0796	181.5945	195.2095	176.4771	175.1940	160.8593	160.1276	165.7126	166.6337	180.2342	185.1028	201.9847	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.7667	15.0554	13.5557	9.9315	7.6714	6.2676	6.9981	9.0963	11.8153	15.5023	17.5098	19.2883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.8629	-24.6758	-36.7976	-42.9822	-47.7663	-45.1353	-44.6358	-41.4793	-36.0841	-28.9917	-18.8764	-14.4793	(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	-6.9400	-14.8449	-29.9587	-45.6496	-60.9802	-61.4651	-60.6893	-51.0500	-37.0154	-21.3825	-9.3185	-5.4657	(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	850.3029	(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	2153.2097	(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)	151.4581	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-803.5265	(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	2437.4442	(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	850.3029	0.2100	178.5636	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2153.2097	0.2100	452.1740	(264)
Space and water heating			630.7376	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.4581	0.1443	21.8601	(268)

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Energy saving/generation technologies				
PV Unit electricity used in dwelling	-398.7666	0.1338	-53.3505	
PV Unit electricity exported	-404.7598	0.1255	-50.7948	
Total			-104.1453	(269)
Total CO2, kg/year			560.3817	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	850.3029	1.1300	960.8423	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2153.2097	1.1300	2433.1269	(278)
Space and water heating			3393.9692	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.4581	1.5338	232.3115	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-398.7666	1.4944	-595.9230	
PV Unit electricity exported	-404.7598	0.4606	-186.4446	
Total			-782.3677	(283)
Total Primary energy kWh/year			2974.0138	(286)
Target Primary Energy Rate (TPER)			60.9800	(287)

BASELINE

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elmhurst energy

Property Reference	Flat 09 - 2B2P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	75 C	**DER**	30.46	**TER**	11.20
Environmental	75 C	**% DER < TER**			-171.96
CO_2 Emissions (t/year)	2	**DFEE**	82.51	**TFEE**	31.90
Compliance Check	See BREL	**% DFEE < TFEE**			-158.65
% DPER < TPER	-183.42	**DPER**	166.48	**TPER**	58.74

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	73.9000	(1b)	x 3.1000	(2b) =	229.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	229.0900	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0873 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.5873 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4552 (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	0.5803	0.5689	0.5576	0.5007	0.4893	0.4324	0.4324	0.4210	0.4552	0.4893	0.5121	0.5348	(22b)
Effective ac	0.6684	0.6619	0.6554	0.6253	0.6197	0.5935	0.5935	0.5886	0.6036	0.6197	0.6311	0.6430	(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								
Ext Glazing - Resi New			12.0300	1.5038	18.0902			(27)
Ext Wall 1	29.4500	6.4100	23.0400	0.2600	5.9904			(29a)
Ext Wall 2	2.7900		2.7900	0.2600	0.7254			(29a)
Ext Wall 3	26.5700	5.6200	20.9500	0.2600	5.4470			(29a)
External Roof 1	73.9000		73.9000	0.1600	11.8240			(30)
Total net area of external elements Aum(A, m2)			132.7100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		71.4320			(33)
Main dwelling								
Party Wall 1			58.7100	0.5000	29.3550			(32)
Party Floor 1			73.9000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	26.5420	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 97.9740	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	50.5301	50.0358	49.5512	47.2753	46.8495	44.8673	44.8673	44.5002	45.6308	46.8495	47.7109	48.6115	(38)
Heat transfer coeff													

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	148.5041	148.0098	147.5252	145.2494	144.8236	142.8413	142.8413	142.4743	143.6049	144.8236	145.6850	146.5855 (39)
Average = Sum(39)m / 12 =												145.2473

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0095	2.0028	1.9963	1.9655	1.9597	1.9329	1.9329	1.9279	1.9432	1.9597	1.9714	1.9836	(40)
HLP (average)												1.9655	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3370 (42)
Hot water usage for mixer showers												
	91.6083	90.2316	88.2254	84.3871	81.5545	78.3956	76.6001	78.5911	80.7735	84.1652	88.0859	91.2573 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	38.5629	37.1606	35.7583	34.3560	32.9537	31.5515	31.5515	32.9537	34.3560	35.7583	37.1606	38.5629 (42c)
Average daily hot water use (litres/day)												119.5169 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	130.1711	127.3922	123.9838	118.7431	114.5083	109.9471	108.1516	111.5448	115.1295	119.9235	125.2466	129.8202	(44)
Energy conte	206.1593	181.4047	190.5584	162.5534	154.1501	135.1928	130.8000	138.1158	141.9662	162.7350	178.4367	203.2670	(45)
Energy content (annual)										Total = Sum(45)m =		1985.3394	
Distribution loss (46)m = 0.15 x (45)m													
	30.9239	27.2107	28.5838	24.3830	23.1225	20.2789	19.6200	20.7174	21.2949	24.4103	26.7655	30.4900	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	285.1969	252.7935	269.5960	239.0414	233.1877	181.1048	178.2424	185.5582	187.8782	241.7726	254.9247	282.3046	(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													
	285.1969	252.7935	269.5960	239.0414	233.1877	181.1048	178.2424	185.5582	187.8782	241.7726	254.9247	282.3046	(64)
										Total per year (kWh/year) = Sum(64)m =		2791.6010	(64)
12Total per year (kWh/year)												2792	(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													
	112.4340	99.9561	107.2468	96.5194	95.1410	62.9612	62.1009	64.5334	65.2134	97.9955	101.8006	111.4724	(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	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	104.3261	115.5039	104.3261	107.8037	104.3261	107.8037	104.3261	104.3261	107.8037	104.3261	107.8037	104.3261	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.2232	208.3631	202.9705	191.4903	176.9986	163.3784	154.2793	152.1393	157.5319	169.0121	183.5039	197.1240	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	(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)													
	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	(71)
Water heating gains (Table 5)													
	151.1210	148.7442	144.1489	134.0547	127.8777	87.4461	83.4690	86.7385	90.5741	131.7144	141.3897	149.8284	(72)
Total internal gains													
	519.7248	530.6658	509.5000	491.4032	467.2569	416.6827	400.1289	401.2584	413.9642	463.1072	490.7518	509.3331	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.6200	36.7938	0.4000	0.9000	0.7700	51.5878	(77)
Southwest	6.4100	36.7938	0.4000	0.9000	0.7700	58.8395	(79)

Solar gains	110.4273	188.0985	257.3646	318.8872	357.1803	354.5973	341.8697	313.3013	278.6714	207.8889	132.2664	94.5027	(83)
Total gains	630.1521	718.7643	766.8646	810.2904	824.4371	771.2800	741.9985	714.5597	692.6357	670.9961	623.0182	603.8359	(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	34.5576	34.6730	34.7869	35.3320	35.4358	35.9276	35.9276	36.0202	35.7366	35.4358	35.2263	35.0099
alpha	3.3038	3.3115	3.3191	3.3555	3.3624	3.3952	3.3952	3.4013	3.3824	3.3624	3.3484	3.3340
util living area												
	0.9919	0.9867	0.9784	0.9585	0.9156	0.8332	0.7047	0.7383	0.8868	0.9623	0.9865	0.9930 (86)
MIT	19.1620	19.3310	19.5982	19.9792	20.3472	20.6508	20.8087	20.7877	20.5509	20.0927	19.5734	19.1480 (87)
Th 2	19.9952	19.9986	20.0019	20.0173	20.0201	20.0335	20.0335	20.0360	20.0284	20.0201	20.0143	20.0082 (88)
util rest of house												

	0.9903	0.9840	0.9737	0.9482	0.8910	0.7749	0.5954	0.6368	0.8441	0.9510	0.9833	0.9916	(89)
MIT 2	18.2966	18.4673	18.7354	19.1237	19.4827	19.7729	19.8966	19.8855	19.6839	19.2402	18.7217	18.2928	(90)
Living area fraction										fLA = Living area / (4) =		0.2995	(91)
MIT	18.5557	18.7260	18.9938	19.3799	19.7416	20.0358	20.1697	20.1557	19.9435	19.4955	18.9767	18.5489	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5557	18.7260	18.9938	19.3799	19.7416	20.0358	20.1697	20.1557	19.9435	19.4955	18.9767	18.5489	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9795	0.9675	0.9398	0.8825	0.7751	0.6127	0.6512	0.8396	0.9433	0.9788	0.9888	(94)
Useful gains	622.0312	704.0171	741.9201	761.4736	727.6020	597.7850	454.6480	465.2968	581.5169	632.9189	609.8241	597.0919	(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													
	2117.0369	2046.3786	1843.1478	1522.1963	1164.6066	776.4595	509.9027	535.0841	839.1585	1288.2717	1730.2615	2103.3395	(97)
Space heating kWh													
	1112.2843	902.0669	819.3134	547.7204	325.1314	0.0000	0.0000	0.0000	0.0000	487.5825	806.7149	1120.6482	(98a)
Space heating requirement - total per year (kWh/year)												6121.4620	
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													
	1112.2843	902.0669	819.3134	547.7204	325.1314	0.0000	0.0000	0.0000	0.0000	487.5825	806.7149	1120.6482	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6121.4620	
Space heating per m2											(98c) / (4) =	82.8344	(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 %)												84.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1112.2843	902.0669	819.3134	547.7204	325.1314	0.0000	0.0000	0.0000	0.0000	487.5825	806.7149	1120.6482	(98)
Space heating efficiency (main heating system 1)													
	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)													
	1316.3127	1067.5348	969.6016	648.1898	384.7709	0.0000	0.0000	0.0000	0.0000	577.0207	954.6922	1326.2109	(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													
	285.1969	252.7935	269.5960	239.0414	233.1877	181.1048	178.2424	185.5582	187.8782	241.7726	254.9247	282.3046	(64)
Efficiency of water heater												89.5000	(216)
(217)m	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	84.5000	(217)
Fuel for water heating, kWh/month													
	337.5111	299.1640	319.0486	282.8893	275.9618	214.3252	210.9377	219.5955	222.3411	286.1215	301.6860	334.0883	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.4876	16.4359	14.7987	10.8422	8.3748	6.8423	7.6398	9.9305	12.8987	16.9238	19.1154	21.0570	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	7244.3337	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	3303.6698	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	165.3469	(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	10799.3505	(238)

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

	Energy	Emission factor	Emissions

Full SAP Calculation Printout

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	7244.3337	0.2100	1521.3101	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3303.6698	0.2100	693.7707	(264)
Space and water heating			2215.0807	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	165.3469	0.1443	23.8647	(268)
Total CO2, kg/year			2250.8747	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			30.4600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	7244.3337	1.1300	8186.0971	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3303.6698	1.1300	3733.1469	(278)
Space and water heating			11919.2440	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	165.3469	1.5338	253.6146	(282)
Total Primary energy kWh/year			12302.9594	(286)
Dwelling Primary energy Rate (DPER)			166.4800	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	73.9000	(1b)	x 3.1000	(2b) =	229.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	229.0900	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1310	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3810	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2952	(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	0.3764	0.3690	0.3617	0.3248	0.3174	0.2805	0.2805	0.2731	0.2952	0.3174	0.3321	0.3469	(22b)
Effective ac	0.5708	0.5681	0.5654	0.5527	0.5504	0.5393	0.5393	0.5373	0.5436	0.5504	0.5552	0.5602	(25)

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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 Opening Type			12.0300	1.1450	13.7748			(27)
Ext Wall 1	29.4500	6.4100	23.0400	0.1800	4.1472			(29a)
Ext Wall 2	2.7900		2.7900	0.1800	0.5022			(29a)
Ext Wall 3	26.5700	5.6200	20.9500	0.1800	3.7710			(29a)
External Roof 1	73.9000		73.9000	0.1100	8.1290			(30)
Total net area of external elements Aum(A, m2)			132.7100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.3242			(33)
Main dwelling								
Party Wall 1			58.7100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	6.6355	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	36.9597	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1560	42.9481	42.7442	41.7866	41.6075	40.7735	40.7735	40.6190	41.0947	41.6075	41.9699	42.3488	(38)

Heat transfer coeff

	80.1158	79.9078	79.7039	78.7463	78.5672	77.7332	77.7332	77.5787	78.0544	78.5672	78.9296	79.3085 (39)
Average = Sum(39)m / 12 =												78.7455

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0841	1.0813	1.0785	1.0656	1.0632	1.0519	1.0519	1.0498	1.0562	1.0632	1.0681	1.0732	(40)
HLP (average)												1.0656	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3370 (42)

Hot water usage for mixer showers

	81.4296	80.2058	78.4226	75.0108	72.4929	69.6850	68.0890	69.8587	71.7987	74.8135	78.2986	81.1176 (42a)

Hot water usage for baths

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)

Hot water usage for other uses

	38.5629	37.1606	35.7583	34.3560	32.9537	31.5515	31.5515	32.9537	34.3560	35.7583	37.1606	38.5629 (42c)

Average daily hot water use (litres/day) 110.1325 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	119.9925	117.3664	114.1809	109.3668	105.4466	101.2365	99.6405	102.8125	106.1547	110.5718	115.4592	119.6805	(44)
Energy conte	190.0387	167.1282	175.4918	149.7177	141.9515	124.4820	120.5065	127.3033	130.8993	150.0449	164.4928	187.3907	(45)
Energy content (annual)										Total = Sum(45)m =		1829.4475	
Distribution loss (46)m = 0.15 x (45)m													
	28.5058	25.0692	26.3238	22.4577	21.2927	18.6723	18.0760	19.0955	19.6349	22.5067	24.6739	28.1086	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)
Total storage loss													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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													
	240.9648	213.1260	226.4179	199.0010	192.8775	173.7653	171.4326	178.2294	180.1826	200.9710	213.7761	238.3168	(62)
WWHRS	-37.2262	-32.9232	-34.4752	-28.5468	-26.6046	-22.7658	-21.3393	-22.6922	-23.5544	-27.7680	-31.4578	-36.5368	(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													
	203.7386	180.2028	191.9427	170.4541	166.2729	150.9996	150.0933	155.5372	156.6283	173.2030	182.3184	201.7799	(64)
										Total per year (kWh/year) = Sum(64)m =		2083.1707	(64)
12Total per year (kWh/year)												2083	(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													
	103.9287	92.3683	99.0919	89.2078	87.9397	80.8169	80.8093	83.0692	82.9507	90.6308	94.1205	103.0483	(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	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	108.1524	119.7401	108.1524	111.7574	108.1524	111.7574	108.1524	108.1524	111.7574	108.1524	111.7574	108.1524	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.2232	208.3631	202.9705	191.4903	176.9986	163.3784	154.2793	152.1393	157.5319	169.0121	183.5039	197.1240	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	(71)
Water heating gains (Table 5)													
	139.6892	137.4529	133.1880	123.8997	118.1985	112.2457	108.6146	111.6522	115.2093	121.8156	130.7229	138.5057	(72)
Total internal gains													
	515.1192	526.6106	505.3654	488.2019	464.4040	445.4361	429.1008	429.9984	442.5532	460.0346	487.0388	504.8367	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.6200	36.7938	0.6300	0.7000	0.7700	63.1951	(77)
Southwest	6.4100	36.7938	0.6300	0.7000	0.7700	72.0784	(79)

Solar gains	135.2734	230.4207	315.2716	390.6368	437.5458	434.3817	418.7903	383.7941	341.3725	254.6639	162.0264	115.7659 (83)
Total gains	650.3926	757.0313	820.6370	878.8387	901.9498	879.8178	847.8911	813.7925	783.9257	714.6986	649.0651	620.6025 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.0566	64.2234	64.3876	65.1706	65.3192	66.0200	66.0200	66.1514	65.7483	65.3192	65.0193	64.7086	
alpha	5.2704	5.2816	5.2925	5.3447	5.3546	5.4013	5.4013	5.4101	5.3832	5.3546	5.3346	5.3139	
util living area													
	0.9884	0.9741	0.9464	0.8744	0.7426	0.5538	0.4016	0.4357	0.6557	0.8932	0.9742	0.9907	(86)
MIT	19.9795	20.1934	20.4430	20.7283	20.9102	20.9849	20.9978	20.9966	20.9637	20.7366	20.3156	19.9444	(87)
Th 2	20.0138	20.0161	20.0184	20.0290	20.0310	20.0403	20.0403	20.0421	20.0367	20.0310	20.0270	20.0228	(88)

util rest of house	0.9849	0.9666	0.9312	0.8412	0.6846	0.4758	0.3150	0.3465	0.5763	0.8574	0.9655	0.9879	(89)
MIT 2	18.8489	19.1186	19.4275	19.7699	19.9609	20.0323	20.0397	20.0409	20.0148	19.7886	19.2831	18.8112	(90)
Living area fraction										fLA = Living area / (4) =		0.2995	(91)
MIT	19.1874	19.4404	19.7316	20.0569	20.2452	20.3176	20.3266	20.3271	20.2990	20.0725	19.5923	19.1505	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1874	19.4404	19.7316	20.0569	20.2452	20.3176	20.3266	20.3271	20.2990	20.0725	19.5923	19.1505	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9810	0.9611	0.9259	0.8423	0.6981	0.4988	0.3410	0.3732	0.5988	0.8592	0.9605	0.9845	(94)
Useful gains	638.0142	727.5801	759.8243	740.2079	629.6605	438.8743	289.1002	303.7200	469.4029	614.0542	623.4147	610.9590	(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	1192.7176	1161.8946	1054.6109	878.5646	671.3707	444.4450	289.6776	304.6585	483.8572	744.2289	986.0128	1185.7059	(97)
Space heating kWh	412.6993	291.8593	219.3212	99.6168	31.0324	0.0000	0.0000	0.0000	0.0000	96.8500	261.0706	427.6117	(98a)
Space heating requirement - total per year (kWh/year)												1840.0613	
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	412.6993	291.8593	219.3212	99.6168	31.0324	0.0000	0.0000	0.0000	0.0000	96.8500	261.0706	427.6117	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1840.0613	
Space heating per m2											(98c) / (4) =	24.8993	(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	412.6993	291.8593	219.3212	99.6168	31.0324	0.0000	0.0000	0.0000	0.0000	96.8500	261.0706	427.6117	(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)	447.1282	316.2072	237.6178	107.9272	33.6212	0.0000	0.0000	0.0000	0.0000	104.9296	282.8501	463.2846	(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	203.7386	180.2028	191.9427	170.4541	166.2729	150.9996	150.0933	155.5372	156.6283	173.2030	182.3184	201.7799	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6089	85.1347	84.3596	82.8991	81.0927	79.8000	79.8000	79.8000	79.8000	82.8100	84.8644	85.7013	(217)
Fuel for water heating, kWh/month	237.9877	211.6679	227.5292	205.6164	205.0406	189.2225	188.0868	194.9087	196.2760	209.1571	214.8349	235.4457	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.4719	18.0278	16.2320	11.8923	9.1859	7.5050	8.3797	10.8923	14.1480	18.5630	20.9668	23.0965	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.0867	-36.4790	-54.0635	-62.7371	-69.3364	-65.3316	-64.5341	-60.0962	-52.5409	-42.5864	-27.9736	-21.5613	(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	-10.9814	-23.4058	-47.0906	-71.5646	-95.4444	-96.1973	-95.0625	-80.1113	-58.2249	-33.7443	-14.7494	-8.6609	(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	1993.5659	(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	2515.7737	(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)	181.3613	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1217.5642	(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	3559.1366	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year

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Space heating - main system 1	1993.5659	0.2100	418.6488	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2515.7737	0.2100	528.3125	(264)
Space and water heating			946.9613	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	181.3613	0.1443	26.1760	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.3267	0.1339	-77.9954	
PV Unit electricity exported	-635.2375	0.1256	-79.7553	
Total			-157.7507	(269)
Total CO2, kg/year			827.3159	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1993.5659	1.1300	2252.7295	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2515.7737	1.1300	2842.8242	(278)
Space and water heating			5095.5537	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	181.3613	1.5338	278.1780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.3267	1.4950	-870.5632	
PV Unit electricity exported	-635.2375	0.4608	-292.7466	
Total			-1163.3098	(283)
Total Primary energy kWh/year			4340.5227	(286)
Target Primary Energy Rate (TPER)			58.7400	(287)

PROPOSED

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 01 - 1B1P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	69 C	**DER**	9.55	**TER**	14.69
Environmental	93 A	**% DER < TER**			34.99
CO_2 Emissions (t/year)	0.42	**DFEE**	94.50	**TFEE**	38.83
Compliance Check	See BREL	**% DFEE < TFEE**			-143.40
% DPER < TPER	-26.11	**DPER**	98.54	**TPER**	78.14

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	48.8800	(1b)	x 3.1000	(2b) =	151.5280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	151.5280	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1320 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6320 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5372 (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	0.6849	0.6715	0.6581	0.5909	0.5775	0.5103	0.5103	0.4969	0.5372	0.5775	0.6043	0.6312	(22b)
Effective ac	0.7346	0.7254	0.7165	0.6746	0.6667	0.6302	0.6302	0.6235	0.6443	0.6667	0.6826	0.6992	(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								
Ext Glazing - Resi New			3.7000	1.5038	5.5639			(27)
Heatloss Floor 1			48.8800	0.2500	12.2200			(28a)
Ext Wall 1	24.0600	3.7000	20.3600	0.3000	6.1080			(29a)
ExtWall 2	13.4800		13.4800	0.3000	4.0440			(29a)
Ext Wall 3: Bin Store	14.8800		14.8800	0.2600	3.8688			(29a)
Total net area of external elements Aum(A, m2)			101.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.5997			(33)
Main dwelling								
Party Wall 1			29.5900	0.5000	14.7950			(32)
Party Ceiling 1			48.8800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	20.2600	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 66.8597	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.7309	36.2755	35.8291	33.7322	33.3399	31.5136	31.5136	31.1754	32.2171	33.3399	34.1335	34.9633	(38)
Heat transfer coeff													

	103.5906	103.1352	102.6888	100.5919	100.1996	98.3733	98.3733	98.0351	99.0768	100.1996	100.9933	101.8230 (39)
Average = Sum(39)m / 12 =												100.5900

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1193	2.1100	2.1008	2.0579	2.0499	2.0125	2.0125	2.0056	2.0269	2.0499	2.0661	2.0831	(40)
HLP (average)												2.0579	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6572 (42)
Hot water usage for mixer showers												
	75.0811	73.9528	72.3086	69.1628	66.8412	64.2522	62.7806	64.4124	66.2011	68.9809	72.1943	74.7935 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	31.6012	30.4520	29.3029	28.1538	27.0046	25.8555	25.8555	27.0046	28.1538	29.3029	30.4520	31.6012 (42c)
Average daily hot water use (litres/day)												97.9506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	106.6823	104.4049	101.6115	97.3165	93.8458	90.1077	88.6361	91.4170	94.3549	98.2838	102.6463	106.3947	(44)
Energy conte	168.9587	148.6711	156.1731	133.2215	126.3345	110.7980	107.1977	113.1934	116.3490	133.3702	146.2385	166.5883	(45)
Energy content (annual)										Total = Sum(45)m =		1627.0941	
Distribution loss (46)m = 0.15 x (45)m													
	25.3438	22.3007	23.4260	19.9832	18.9502	16.6197	16.0797	16.9790	17.4523	20.0055	21.9358	24.9882	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	247.9963	220.0599	235.2107	209.7095	205.3721	156.7100	154.6401	160.6358	162.2610	212.4078	222.7265	245.6259	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	247.9963	220.0599	235.2107	209.7095	205.3721	156.7100	154.6401	160.6358	162.2610	212.4078	222.7265	245.6259	(64)
										Total per year (kWh/year) = Sum(64)m =		2433.3557	(64)
12Total per year (kWh/year)												2433	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	100.0649	89.0722	95.8137	86.7665	85.8923	54.8499	54.2532	56.2467	56.6956	88.2317	91.0947	99.2767	(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	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	84.5371	93.5946	84.5371	87.3550	84.5371	87.3550	84.5371	84.5371	87.3550	84.5371	87.3550	84.5371	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.3254	145.8231	142.0490	134.0146	123.8726	114.3405	107.9725	106.4748	110.2488	118.2833	128.4253	137.9574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	(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)													
	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	(71)
Water heating gains (Table 5)													
	134.4958	132.5479	128.7818	120.5091	115.4467	76.1804	72.9209	75.6004	78.7439	118.5909	126.5204	133.4364	(72)
Total internal gains													
	411.2159	419.8233	403.2256	389.7364	371.7140	325.7336	313.2881	314.4700	324.2054	369.2690	390.1584	403.7886	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	3.7000	11.2829	0.4000	0.9000	0.7700	10.4150	(81)

Solar gains	10.4150	21.2001	38.1958	62.7284	84.3193	89.8933	84.0933	67.0402	46.5421	25.9082	13.1048	8.5054	(83)
Total gains	421.6310	441.0233	441.4214	452.4648	456.0333	415.6269	397.3815	381.5102	370.7476	395.1771	403.2632	412.2940	(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	32.7679	32.9126	33.0557	33.7447	33.8768	34.5057	34.5057	34.6248	34.2607	33.8768	33.6106	33.3367
alpha	3.1845	3.1942	3.2037	3.2496	3.2585	3.3004	3.3004	3.3083	3.2840	3.2585	3.2407	3.2224
util living area												
	0.9915	0.9893	0.9856	0.9744	0.9478	0.8963	0.7991	0.8275	0.9338	0.9732	0.9874	0.9922 (86)
Living	19.0694	19.1899	19.4264	19.8097	20.1995	20.5414	20.7429	20.7145	20.4278	19.9765	19.4876	19.0748
Non living	18.1622	18.2859	18.5252	18.9224	19.3085	19.6491	19.8195	19.8024	19.5410	19.0919	18.5998	18.1814
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	20.0124	19.1899	19.4264	19.8097	20.1995	20.5414	20.7429	20.7145	20.4278	19.9765	19.4876	19.3441	(87)
Th 2	19.9404	19.9450	19.9496	19.9710	19.9750	19.9937	19.9937	19.9972	19.9865	19.9750	19.9669	19.9584	(88)
util rest of house													
	0.9898	0.9871	0.9822	0.9675	0.9304	0.8511	0.6968	0.7368	0.9039	0.9646	0.9843	0.9907	(89)
MIT 2	19.0307	18.2859	18.5252	18.9224	19.3085	19.6491	19.8195	19.8024	19.5410	19.0919	18.5998	18.4300	(90)
Living area fraction										fLA = Living area / (4) =		0.4918	(91)
MIT	19.5135	18.7305	18.9684	19.3588	19.7467	20.0879	20.2737	20.2510	19.9771	19.5269	19.0364	18.8796	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5135	18.7305	18.9684	19.3588	19.7467	20.0879	20.2737	20.2510	19.9771	19.5269	19.0364	18.8796	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9890	0.9836	0.9781	0.9622	0.9256	0.8562	0.7298	0.7639	0.9036	0.9598	0.9807	0.9885	(94)
Useful gains	416.9756	433.8012	431.7705	435.3747	422.1009	355.8759	290.0093	291.4167	334.9972	379.2855	395.4701	407.5684	(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													
	1575.9791	1426.4089	1280.3667	1052.0716	806.2778	539.8677	361.3896	377.5322	582.2870	894.4740	1205.5008	1494.7162	(97)
Space heating kWh													
	862.2986	667.0323	631.3555	444.0218	285.8276	0.0000	0.0000	0.0000	0.0000	383.3002	583.2221	808.8379	(98a)
Space heating requirement - total per year (kWh/year)												4665.8961	
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													
	862.2986	667.0323	631.3555	444.0218	285.8276	0.0000	0.0000	0.0000	0.0000	383.3002	583.2221	808.8379	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4665.8961	
Space heating per m2											(98c) / (4) =	95.4561	(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 %)	228.3849 (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													
	862.2986	667.0323	631.3555	444.0218	285.8276	0.0000	0.0000	0.0000	0.0000	383.3002	583.2221	808.8379	(98)
Space heating efficiency (main heating system 1)													
	228.3849	228.3849	228.3849	228.3849	228.3849	0.0000	0.0000	0.0000	0.0000	228.3849	228.3849	228.3849	(210)
Space heating fuel (main heating system)													
	377.5637	292.0650	276.4436	194.4182	125.1517	0.0000	0.0000	0.0000	0.0000	167.8308	255.3681	354.1556	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	247.9963	220.0599	235.2107	209.7095	205.3721	156.7100	154.6401	160.6358	162.2610	212.4078	222.7265	245.6259	(64)
Efficiency of water heater												172.6424	(216)
(217)m	172.6424	172.6424	172.6424	172.6424	172.6424	172.6424	172.6424	172.6424	172.6424	172.6424	172.6424	172.6424	(217)
Fuel for water heating, kWh/month													
	143.6474	127.4658	136.2416	121.4705	118.9581	90.7714	89.5725	93.0454	93.9868	123.0334	129.0104	142.2744	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	16.6014	13.3183	11.9916	8.7856	6.7862	5.5444	6.1906	8.0468	10.4520	13.7136	15.4895	17.0628	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.5257	-29.3826	-47.6521	-59.1487	-67.0088	-55.9012	-55.0980	-50.3854	-42.0880	-35.1919	-21.2149	-15.5669	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2042.9968 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	172.6424
Water heating fuel used	1409.4777 (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)	133.9831 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-497.1643 (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	3089.2933 (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	2042.9968	0.1537	314.0039	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1409.4777	0.1418	199.8532	(264)
Space and water heating			513.8571	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	133.9831	0.1443	19.3379	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-497.1643	0.1336	-66.4440	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-66.4440	(269)
Total CO2, kg/year			466.7510	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.5500	(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	2042.9968	1.5690	3205.4873	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1409.4777	1.5244	2148.5510	(278)
Space and water heating			5354.0383	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	133.9831	1.5338	205.5078	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-497.1643	1.4939	-742.7155	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-742.7155	(283)
Total Primary energy kWh/year			4816.8305	(286)
Dwelling Primary energy Rate (DPER)			98.5400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	48.8800	(1b)	x 3.1000	(2b) =	151.5280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.5280	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1320	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3820	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3247	(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	0.4140	0.4059	0.3977	0.3572	0.3490	0.3085	0.3085	0.3003	0.3247	0.3490	0.3653	0.3815	(22b)
Effective ac	0.5857	0.5824	0.5791	0.5638	0.5609	0.5476	0.5476	0.5451	0.5527	0.5609	0.5667	0.5728	(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 Opening Type			3.7000	1.1450	4.2366			(27)
Heatloss Floor 1			48.8800	0.1300	6.3544			(28a)
Ext Wall 1	24.0600	3.7000	20.3600	0.1800	3.6648			(29a)
ExtWall 2	13.4800		13.4800	0.1800	2.4264			(29a)
Ext Wall 3: Bin Store	14.8800		14.8800	0.1800	2.6784			(29a)
Total net area of external elements Aum(A, m2)			101.3000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 19.3606 (33)
Main dwelling
Party Wall 1 29.5900 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area) 5.0650 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.4256 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.2870	29.1206	28.9575	28.1915	28.0481	27.3809	27.3809	27.2574	27.6379	28.0481	28.3381	28.6412	(38)
Heat transfer coeff	53.7126	53.5462	53.3831	52.6171	52.4738	51.8066	51.8066	51.6830	52.0636	52.4738	52.7637	53.0668	(39)
Average = Sum(39)m / 12 =												52.6164	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0989	1.0955	1.0921	1.0765	1.0735	1.0599	1.0599	1.0573	1.0651	1.0735	1.0795	1.0857	(40)
HLP (average)												1.0764	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6572 (42)
Hot water usage for mixer showers

66.7388	65.7358	64.2743	61.4780	59.4144	57.1131	55.8050	57.2554	58.8454	61.3163	64.1727	66.4831	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

31.6012	30.4520	29.3029	28.1538	27.0046	25.8555	25.8555	27.0046	28.1538	29.3029	30.4520	31.6012	(42c)

Average daily hot water use (litres/day) 90.2593 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.3400	96.1879	93.5772	89.6318	86.4190	82.9686	81.6605	84.2601	86.9992	90.6192	94.6248	98.0843	(44)
Energy conte	155.7465	136.9703	143.8247	122.7014	116.3366	102.0196	98.7613	104.3316	107.2787	122.9694	134.8103	153.5763	(45)
Energy content (annual)										Total = Sum(45)m =		1499.3268	

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

23.3620	20.5455	21.5737	18.4052	17.4505	15.3029	14.8142	15.6497	16.0918	18.4454	20.2215	23.0364	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

202.3414	179.0560	190.4196	167.7933	162.9316	147.1114	145.3562	150.9265	152.3705	169.5643	179.9021	200.1712	(62)
WWHRS -30.5102	-26.9835	-28.2555	-23.3967	-21.8049	-18.6586	-17.4895	-18.5983	-19.3049	-22.7583	-25.7824	-29.9452	(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													
171.8312	152.0725	162.1641	144.3966	141.1267	128.4528	127.8668	132.3282	133.0656	146.8060	154.1197	170.2260	(64)
									Total per year (kWh/year) = Sum(64)m =		1764.4563	(64)
12Total per year (kWh/year)											1764	(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

89.0616	79.2112	85.0976	76.8717	75.9579	69.9950	70.1141	71.9662	71.7436	78.1633	80.8979	88.3400	(65)

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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	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	82.8590	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.7643	98.2748	88.7643	91.7232	88.7643	91.7232	88.7643	88.7643	91.7232	88.7643	91.7232	88.7643	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.3254	145.8231	142.0490	134.0146	123.8726	114.3405	107.9725	106.4748	110.2488	118.2833	128.4253	137.9574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	31.2859	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	-66.2872	(71)
Water heating gains (Table 5)	119.7065	117.8738	114.3786	106.7663	102.0939	97.2152	94.2393	96.7287	99.6439	105.0581	112.3582	118.7366	(72)
Total internal gains	403.6539	412.8294	396.0496	383.3617	365.5885	351.1366	338.8338	339.8256	349.4736	362.9635	383.3644	396.3160	(73)

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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	
Northwest	3.7000	11.2829	0.6300	0.7000	0.7700	12.7584	(81)

Solar gains	12.7584	25.9701	46.7898	76.8423	103.2911	110.1193	103.0143	82.1242	57.0141	31.7375	16.0534	10.4191	(83)
Total gains	416.4123	438.7994	442.8395	460.2040	468.8796	461.2559	441.8482	421.9498	406.4877	394.7009	399.4177	406.7352	(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	63.1964	63.3928	63.5865	64.5122	64.6884	65.5215	65.5215	65.6781	65.1981	64.6884	64.3329	63.9655	
alpha	5.2131	5.2262	5.2391	5.3008	5.3126	5.3681	5.3681	5.3785	5.3465	5.3126	5.2889	5.2644	
util living area													
	0.9901	0.9854	0.9763	0.9430	0.8579	0.6797	0.5086	0.5519	0.7861	0.9432	0.9813	0.9912	(86)
MIT	19.9270	20.0482	20.2426	20.5495	20.8093	20.9598	20.9928	20.9891	20.9116	20.6142	20.2414	19.9163	(87)
Th 2	20.0018	20.0045	20.0073	20.0201	20.0225	20.0337	20.0337	20.0358	20.0294	20.0225	20.0176	20.0126	(88)
util rest of house													
	0.9871	0.9808	0.9685	0.9233	0.8102	0.5928	0.4008	0.4421	0.7086	0.9197	0.9746	0.9885	(89)
MIT 2	18.7736	18.9290	19.1763	19.5632	19.8604	20.0106	20.0314	20.0320	19.9704	19.6474	19.1843	18.7680	(90)
Living area fraction										fLA = Living area / (4) =		0.4918	(91)
MIT	19.3409	19.4794	19.7007	20.0483	20.3271	20.4774	20.5043	20.5027	20.4333	20.1229	19.7042	19.3328	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3409	19.4794	19.7007	20.0483	20.3271	20.4774	20.5043	20.5027	20.4333	20.1229	19.7042	19.3328	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9778	0.9655	0.9240	0.8264	0.6341	0.4540	0.4963	0.7431	0.9225	0.9719	0.9861	(94)
Useful gains	409.9328	429.0665	427.5671	425.2254	387.5006	292.5035	200.6018	209.4026	302.0643	364.1134	388.2046	401.0659	(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													
	807.8847	780.6735	704.6973	586.5896	452.6949	304.4881	202.2670	212.0406	329.7335	499.7025	665.0452	803.0474	(97)
Space heating kWh													
	296.0762	236.2799	206.1849	116.1822	48.5045	0.0000	0.0000	0.0000	0.0000	100.8783	199.3252	299.0743	(98a)
Space heating requirement - total per year (kWh/year)												1502.5056	
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													
	296.0762	236.2799	206.1849	116.1822	48.5045	0.0000	0.0000	0.0000	0.0000	100.8783	199.3252	299.0743	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1502.5056	
Space heating per m2											(98c) / (4) =	30.7387	(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													
	296.0762	236.2799	206.1849	116.1822	48.5045	0.0000	0.0000	0.0000	0.0000	100.8783	199.3252	299.0743	(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)													
	320.7759	255.9913	223.3856	125.8745	52.5510	0.0000	0.0000	0.0000	0.0000	109.2940	215.9537	324.0241	(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													
	171.8312	152.0725	162.1641	144.3966	141.1267	128.4528	127.8668	132.3282	133.0656	146.8060	154.1197	170.2260	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2684	85.0441	84.5995	83.5767	81.9238	79.8000	79.8000	79.8000	79.8000	83.2359	84.6376	85.3101	(217)
Fuel for water heating, kWh/month													
	201.5180	178.8160	191.6845	172.7713	172.2658	160.9684	160.2341	165.8248	166.7489	176.3734	182.0936	199.5379	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.4435	14.7960	13.3222	9.7604	7.5392	6.1596	6.8775	8.9397	11.6118	15.2352	17.2082	18.9561	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.8943	-24.7193	-36.8603	-43.0542	-47.8464	-45.2111	-44.7086	-41.5441	-36.1393	-29.0386	-18.9098	-14.5063	(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	-6.9624	-14.8906	-30.0465	-45.7775	-61.1454	-61.6297	-60.8541	-51.1939	-37.1250	-21.4492	-9.3487	-5.4836	(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												1627.8500	(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												2128.8368	(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)												148.8494	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-805.3388	(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	3186.1974	(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	1627.8500	0.2100	341.8485	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2128.8368	0.2100	447.0557	(264)
Space and water heating			788.9042	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	148.8494	0.1443	21.4836	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-399.4323	0.1338	-53.4400	
PV Unit electricity exported	-405.9066	0.1255	-50.9400	
Total			-104.3800	(269)
Total CO2, kg/year			717.9371	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1627.8500	1.1300	1839.4706	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2128.8368	1.1300	2405.5856	(278)
Space and water heating			4245.0561	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	148.8494	1.5338	228.3102	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-399.4323	1.4944	-596.9195	
PV Unit electricity exported	-405.9066	0.4606	-186.9777	
Total			-783.8972	(283)
Total Primary energy kWh/year			3819.5700	(286)
Target Primary Energy Rate (TPER)			78.1400	(287)

PROPOSED

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 02 - 2B3P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	69 C	**DER**	8.82	**TER**	12.91
Environmental	93 A	**% DER < TER**			31.68
CO_2 Emissions (t/year)	0.47	**DFEE**	94.38	**TFEE**	35.43
Compliance Check	See BREL	**% DFEE < TFEE**			-166.38
% DPER < TPER	-32.53	**DPER**	90.41	**TPER**	68.22

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.3000 (1b)	x	3.1000 (2b)	=	190.0300	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.0300	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1052	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6052	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4691	(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	0.5981	0.5863	0.5746	0.5160	0.5042	0.4456	0.4456	0.4339	0.4691	0.5042	0.5277	0.5512	(22b)
Effective ac	0.6788	0.6719	0.6651	0.6331	0.6271	0.5993	0.5993	0.5941	0.6100	0.6271	0.6392	0.6519	(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								
Ext Glazing - Resi New			7.1500	1.5038	10.7519			(27)
Heatloss Floor 1			61.3000	0.2500	15.3250			(28a)
Ext Wall 1	26.7500	3.8300	22.9200	0.2600	5.9592			(29a)
Ext Wall 2	13.7600	3.3200	10.4400	0.3000	3.1320			(29a)
Extl Wall 3: Bin Store	4.9300		4.9300	0.2600	1.2818			(29a)
Ext Wall 4: Bin Store	9.5200		9.5200	0.3000	2.8560			(29a)
Total net area of external elements Aum(A, m2)			116.2600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.1759			(33)
Main dwelling								
Party Wall 1			55.7400	0.5000	27.8700			(32)
Party Ceiling 1			61.3000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	23.2520	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	90.4279	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.5698	42.1343	41.7075	39.7025	39.3274	37.5811	37.5811	37.2577	38.2538	39.3274	40.0863	40.8796	(38)

Heat transfer coeff

	132.9977	132.5622	132.1354	130.1304	129.7553	128.0090	128.0090	127.6856	128.6816	129.7553	130.5141	131.3075 (39)
Average = Sum(39)m / 12 =												130.1286

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1696	2.1625	2.1556	2.1228	2.1167	2.0882	2.0882	2.0830	2.0992	2.1167	2.1291	2.1420	(40)
HLP (average)												2.1228	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0181 (42)

Hot water usage for mixer showers

	83.8569	82.5967	80.7603	77.2468	74.6538	71.7622	70.1187	71.9411	73.9389	77.0436	80.6326	83.5356 (42a)

Hot water usage for baths

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)

Hot water usage for other uses

	35.2978	34.0142	32.7307	31.4471	30.1636	28.8800	28.8800	30.1636	31.4471	32.7307	34.0142	35.2978 (42c)

Average daily hot water use (litres/day) 109.4021 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	119.1547	116.6109	113.4910	108.6939	104.8174	100.6423	98.9987	102.1047	105.3860	109.7743	114.6469	118.8334	(44)
Energy conte	188.7119	166.0524	174.4314	148.7965	141.1044	123.7514	119.7303	126.4269	129.9515	148.9627	163.3355	186.0644	(45)
Energy content (annual)										Total = Sum(45)m =		1817.3193	

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

	28.3068	24.9079	26.1647	22.3195	21.1657	18.5627	17.9595	18.9640	19.4927	22.3444	24.5003	27.9097 (46)

Water storage loss:

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.0000 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 0.7800 (55)

Total storage loss

	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800 (56)

If cylinder contains dedicated solar storage

	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	267.7495	237.4412	253.4690	225.2845	220.1420	169.6634	167.1727	173.8693	175.8635	228.0003	239.8235	265.1020 (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												
	267.7495	237.4412	253.4690	225.2845	220.1420	169.6634	167.1727	173.8693	175.8635	228.0003	239.8235	265.1020 (64)
										Total per year (kWh/year) = Sum(64)m =		2623.5809 (64)
12Total per year (kWh/year)												2624 (64)

Electric shower(s)

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

Heat gains from water heating, kWh/month

	106.6328	94.8515	101.8845	91.9452	90.8033	59.1569	58.4203	60.6469	61.2185	93.4162	96.7794	105.7525 (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	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	93.9586	104.0256	93.9586	97.0906	93.9586	97.0906	93.9586	93.9586	97.0906	93.9586	97.0906	93.9586	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	176.2133	178.0418	173.4339	163.6243	151.2415	139.6033	131.8283	129.9998	134.6076	144.4172	156.8001	168.4383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	(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)													
	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	(71)
Water heating gains (Table 5)													
	143.3236	141.1480	136.9416	127.7017	122.0474	82.1624	78.5218	81.5146	85.0257	125.5594	134.4159	142.1404	(72)
Total internal gains													
	466.7677	476.4876	457.6063	441.6888	420.5197	372.1284	357.5809	358.7452	369.9960	417.2074	441.5787	457.8095	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.8300	11.2829	0.4000	0.9000	0.7700	10.7809	(75)
Southeast	3.3200	36.7938	0.4000	0.9000	0.7700	30.4754	(77)

Solar gains	41.2563	73.8557	110.5644	152.9378	185.8553	190.9123	181.3960	155.8595	125.0842	84.1909	50.0677	34.8848	(83)
Total gains	508.0240	550.3433	568.1707	594.6266	606.3750	563.0408	538.9770	514.6047	495.0802	501.3983	491.6464	492.6943	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.0077	32.1128	32.2165	32.7129	32.8075	33.2550	33.2550	33.3393	33.0812	32.8075	32.6167	32.4197	
alpha	3.1338	3.1409	3.1478	3.1809	3.1872	3.2170	3.2170	3.2226	3.2054	3.1872	3.1744	3.1613	
util living area													
	0.9924	0.9894	0.9846	0.9714	0.9412	0.8822	0.7794	0.8110	0.9256	0.9728	0.9884	0.9932	(86)
Living	19.0028	19.1418	19.3986	19.7926	20.1943	20.5431	20.7440	20.7140	20.4236	19.9426	19.4248	18.9959	
Non living	18.0767	18.2179	18.4764	18.8799	19.2759	19.6170	19.7838	19.7654	19.5065	19.0324	18.5133	18.0803	

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	19.9783	19.1418	19.3986	19.7926	20.1943	20.5431	20.7440	20.7140	20.4236	19.9426	19.4248	19.2762	(87)
Th 2	19.9152	19.9187	19.9222	19.9386	19.9416	19.9559	19.9559	19.9585	19.9504	19.9416	19.9354	19.9290	(88)
util rest of house													
	0.9908	0.9872	0.9809	0.9636	0.9217	0.8318	0.6704	0.7137	0.8922	0.9639	0.9855	0.9918	(89)
MIT 2	18.9747	18.2179	18.4764	18.8799	19.2759	19.6170	19.7838	19.7654	19.5065	19.0324	18.5133	18.3389	(90)
Living area fraction										fLA = Living area / (4) =		0.3946	(91)
MIT	19.3707	18.5825	18.8403	19.2401	19.6383	19.9824	20.1628	20.1397	19.8684	19.3916	18.8730	18.7088	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3707	18.5825	18.8403	19.2401	19.6383	19.9824	20.1628	20.1397	19.8684	19.3916	18.8730	18.7088	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9898	0.9834	0.9761	0.9570	0.9147	0.8334	0.6957	0.7339	0.8888	0.9578	0.9816	0.9897	(94)
Useful gains	502.8673	541.2249	554.5973	569.0789	554.6724	469.2407	374.9875	377.6617	440.0461	480.2629	482.5907	487.5961	(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													
	2004.3742	1813.7788	1630.5897	1345.5602	1030.0368	688.9998	456.0647	477.5117	742.2910	1140.7529	1536.5415	1905.1114	(97)
Space heating kWh													
	1117.1211	855.1562	800.5384	559.0665	353.6711	0.0000	0.0000	0.0000	0.0000	491.4046	758.8446	1054.6314	(98a)
Space heating requirement - total per year (kWh/year)												5990.4339	
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													
	1117.1211	855.1562	800.5384	559.0665	353.6711	0.0000	0.0000	0.0000	0.0000	491.4046	758.8446	1054.6314	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5990.4339	
Space heating per m2											(98c) / (4) =	97.7232	(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 %)	222.3571	(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													
	1117.1211	855.1562	800.5384	559.0665	353.6711	0.0000	0.0000	0.0000	0.0000	491.4046	758.8446	1054.6314	(98)
Space heating efficiency (main heating system 1)													
	222.3571	222.3571	222.3571	222.3571	222.3571	0.0000	0.0000	0.0000	0.0000	222.3571	222.3571	222.3571	(210)
Space heating fuel (main heating system)													
	502.3997	384.5869	360.0238	251.4274	159.0555	0.0000	0.0000	0.0000	0.0000	220.9980	341.2730	474.2963	(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													
	267.7495	237.4412	253.4690	225.2845	220.1420	169.6634	167.1727	173.8693	175.8635	228.0003	239.8235	265.1020	(64)
Efficiency of water heater												168.7603	(216)
(217)m	168.7603	168.7603	168.7603	168.7603	168.7603	168.7603	168.7603	168.7603	168.7603	168.7603	168.7603	168.7603	(217)
Fuel for water heating, kWh/month													
	158.6566	140.6973	150.1947	133.4937	130.4465	100.5351	99.0592	103.0274	104.2090	135.1030	142.1089	157.0878	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	18.4517	14.8026	13.3281	9.7647	7.5426	6.1623	6.8806	8.9436	11.6169	15.2420	17.2158	18.9645	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.3425	-54.7898	-86.6470	-104.0763	-113.7717	-89.1628	-87.8524	-81.7562	-70.2270	-63.9474	-39.9534	-29.8006	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2694.0605	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	168.7603	
Water heating fuel used	1554.6194	(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)	148.9154	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.3272	(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	3540.2681	(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	2694.0605	0.1538	414.3564	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1554.6194	0.1418	220.4111	(264)
Space and water heating			634.7674	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	148.9154	0.1443	21.4931	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-857.3272	0.1347	-115.4478	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-115.4478	(269)
Total CO2, kg/year			540.8127	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.8200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2694.0605	1.5694	4228.0634	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1554.6194	1.5243	2369.7140	(278)
Space and water heating			6597.7774	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	148.9154	1.5338	228.4114	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-857.3272	1.4977	-1284.0370	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1284.0370	(283)
Total Primary energy kWh/year			5542.1518	(286)
Dwelling Primary energy Rate (DPER)			90.4100	(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	61.3000	(1b) x	3.1000	(2b) =	190.0300	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.0300	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1052 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3552 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2753 (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	0.3510	0.3441	0.3373	0.3028	0.2960	0.2616	0.2616	0.2547	0.2753	0.2960	0.3097	0.3235	(22b)
Effective ac	0.5616	0.5592	0.5569	0.5459	0.5438	0.5342	0.5342	0.5324	0.5379	0.5438	0.5480	0.5523	(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 Opening Type			7.1500	1.1450	8.1870			(27)
Heatloss Floor 1			61.3000	0.1300	7.9690			(28a)
Ext Wall 1	26.7500	3.8300	22.9200	0.1800	4.1256			(29a)
Ext Wall 2	13.7600	3.3200	10.4400	0.1800	1.8792			(29a)

Extl Wall 3: Bin Store	4.9300	4.9300	0.1800	0.8874		(29a)
Ext Wall 4: Bin Store	9.5200	9.5200	0.1800	1.7136		(29a)
Total net area of external elements Aum(A, m2)		116.2600				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		24.7618		(33)
Main dwelling						
Party Wall 1		55.7400	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	5.8130	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	30.5748	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.2185	35.0685	34.9214	34.2307	34.1015	33.4999	33.4999	33.3885	33.7316	34.1015	34.3629	34.6362	(38)
Heat transfer coeff	65.7933	65.6433	65.4963	64.8055	64.6763	64.0747	64.0747	63.9633	64.3064	64.6763	64.9377	65.2111	(39)
Average = Sum(39)m / 12 =												64.8049	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0733	1.0709	1.0685	1.0572	1.0551	1.0453	1.0453	1.0434	1.0490	1.0551	1.0593	1.0638	(40)
HLP (average)												1.0572	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0181	(42)
Hot water usage for mixer showers	74.5395	73.4193	71.7869	68.6638	66.3590	63.7887	62.3277	63.9477	65.7235	68.4832	71.6734	74.2539	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	35.2978	34.0142	32.7307	31.4471	30.1636	28.8800	28.8800	30.1636	31.4471	32.7307	34.0142	35.2978	(42c)
Average daily hot water use (litres/day)												100.8118	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.8373	107.4335	104.5176	100.1109	96.5225	92.6687	91.2077	94.1112	97.1706	101.2139	105.6877	109.5517	(44)
Energy conte	173.9554	152.9839	160.6397	137.0468	129.9379	113.9470	110.3078	116.5294	119.8211	137.3463	150.5715	171.5314	(45)
Energy content (annual)										Total = Sum(45)m =		1674.6181	
Distribution loss (46)m = 0.15 x (45)m	26.0933	22.9476	24.0960	20.5570	19.4907	17.0920	16.5462	17.4794	17.9732	20.6019	22.5857	25.7297	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	224.8814	198.9816	211.5658	186.3301	180.8640	163.2302	161.2339	167.4554	169.1043	188.2723	199.8548	222.4575	(62)
WWHRS	-34.0763	-30.1374	-31.5581	-26.1314	-24.3535	-20.8395	-19.5337	-20.7721	-21.5613	-25.4184	-28.7960	-33.4453	(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	190.8051	168.8443	180.0076	160.1988	156.5105	142.3908	141.7002	146.6833	147.5430	162.8539	171.0588	189.0122	(64)
									Total per year (kWh/year) = Sum(64)m =			1957.6085	(64)
12Total per year (kWh/year)												1958	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	98.5810	87.6653	94.1536	84.9947	83.9452	77.3140	77.4182	79.4869	79.2671	86.4085	89.4917	97.7751	(65)

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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	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	100.9071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.2741	109.9106	99.2741	102.5832	99.2741	102.5832	99.2741	99.2741	102.5832	99.2741	102.5832	99.2741	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.2133	178.0418	173.4339	163.6243	151.2415	139.6033	131.8283	129.9998	134.6076	144.4172	156.8001	168.4383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	33.0907	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	-80.7257	(71)
Water heating gains (Table 5)	132.5014	130.4544	126.5505	118.0482	112.8296	107.3806	104.0567	106.8372	110.0932	116.1404	124.2940	131.4181	(72)
Total internal gains	464.2608	474.6789	455.5306	440.5279	419.6172	402.8392	388.4312	389.3832	400.5562	416.1039	439.9494	455.4025	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.8300	11.2829	0.6300	0.7000	0.7700	13.2067	(75)
Southeast	3.3200	36.7938	0.6300	0.7000	0.7700	37.3323	(77)

Solar gains	50.5390	90.4733	135.4414	187.3488	227.6727	233.8676	222.2101	190.9279	153.2282	103.1339	61.3329	42.7339	(83)
Total gains	514.7998	565.1521	590.9720	627.8767	647.2900	636.7068	610.6414	580.3111	553.7844	519.2378	501.2823	498.1364	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.7017	64.8496	64.9952	65.6880	65.8192	66.4372	66.4372	66.5529	66.1978	65.8192	65.5542	65.2795	
alpha	5.3134	5.3233	5.3330	5.3792	5.3879	5.4291	5.4291	5.4369	5.4132	5.3879	5.3703	5.3520	
util living area	0.9905	0.9831	0.9683	0.9204	0.8109	0.6217	0.4579	0.5007	0.7380	0.9301	0.9807	0.9919	(86)
MIT	19.9557	20.1106	20.3300	20.6332	20.8637	20.9746	20.9959	20.9935	20.9376	20.6624	20.2691	19.9315	(87)
Th 2	20.0227	20.0247	20.0267	20.0360	20.0377	20.0458	20.0458	20.0473	20.0427	20.0377	20.0342	20.0305	(88)
util rest of house	0.9875	0.9779	0.9584	0.8956	0.7576	0.5384	0.3606	0.4003	0.6584	0.9030	0.9738	0.9894	(89)
MIT 2	18.8255	19.0226	19.2988	19.6722	19.9261	20.0317	20.0445	20.0450	20.0026	19.7145	19.2316	18.8007	(90)
Living area fraction										fLA = Living area / (4) =		0.3946	(91)
MIT	19.2715	19.4519	19.7057	20.0514	20.2961	20.4038	20.4199	20.4193	20.3716	20.0886	19.6410	19.2469	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2715	19.4519	19.7057	20.0514	20.2961	20.4038	20.4199	20.4193	20.3716	20.0886	19.6410	19.2469	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9846	0.9741	0.9544	0.8960	0.7730	0.5705	0.3991	0.4401	0.6873	0.9047	0.9703	0.9867	(94)
Useful gains	506.8491	550.5034	564.0005	562.6006	500.3464	363.2588	243.7334	255.3664	380.6431	469.7443	486.3761	491.5329	(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	985.0236	955.2356	864.9245	722.6738	555.9641	371.8769	244.7612	257.0878	403.3020	613.6872	814.3848	981.2252	(97)
Space heating kWh	355.7618	271.9800	223.8874	115.2527	41.3796	0.0000	0.0000	0.0000	0.0000	107.0935	236.1662	364.3311	(98a)
Space heating requirement - total per year (kWh/year)												1715.8523	
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	355.7618	271.9800	223.8874	115.2527	41.3796	0.0000	0.0000	0.0000	0.0000	107.0935	236.1662	364.3311	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1715.8523	
Space heating per m2											(98c) / (4) =	27.9911	(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	355.7618	271.9800	223.8874	115.2527	41.3796	0.0000	0.0000	0.0000	0.0000	107.0935	236.1662	364.3311	(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)	385.4408	294.6696	242.5649	124.8675	44.8316	0.0000	0.0000	0.0000	0.0000	116.0276	255.8680	394.7249	(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	190.8051	168.8443	180.0076	160.1988	156.5105	142.3908	141.7002	146.6833	147.5430	162.8539	171.0588	189.0122	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4362	85.1229	84.5501	83.3339	81.5278	79.8000	79.8000	79.8000	79.8000	83.1430	84.7834	85.5059	(217)
Fuel for water heating, kWh/month	223.3305	198.3535	212.9005	192.2371	191.9719	178.4346	177.5692	183.8137	184.8910	195.8720	201.7598	221.0516	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.6272	16.5479	14.8995	10.9160	8.4319	6.8889	7.6918	9.9981	12.9866	17.0391	19.2456	21.2005	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.9914	-30.6162	-45.5094	-52.9769	-58.7033	-55.3851	-54.7352	-50.9172	-44.4094	-35.8464	-23.4489	-18.0329	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9270	-19.0582	-38.3978	-58.4262	-77.9823	-78.6030	-77.6500	-65.3848	-47.4708	-27.4699	-11.9898	-7.0364	(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 1858.9949 (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 2362.1854 (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) 166.4732 (232)

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

PV generation -1009.9687 (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	3463.6848	(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	1858.9949	0.2100	390.3889	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2362.1854	0.2100	496.0589	(264)
Space and water heating			886.4479	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.4732	0.1443	24.0272	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-491.5724	0.1339	-65.8054	
PV Unit electricity exported	-518.3963	0.1255	-65.0709	
Total			-130.8763	(269)
Total CO2, kg/year			791.5280	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.9100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1858.9949	1.1300	2100.6642	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2362.1854	1.1300	2669.2695	(278)
Space and water heating			4769.9337	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	166.4732	1.5338	255.3422	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-491.5724	1.4947	-734.7581	
PV Unit electricity exported	-518.3963	0.4607	-238.8460	
Total			-973.6041	(283)
Total Primary energy kWh/year			4181.7725	(286)
Target Primary Energy Rate (TPER)			68.2200	(287)

PROPOSED

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 03 - 1B1P			**Issued on Date**	20/08/2025
Assessment Reference	00001		**Prop Type Ref**		
Property	Wells Road				

SAP Rating	69 C	**DER**	10.10	**TER**	11.45
Environmental	94 A	**% DER < TER**			11.79
CO_2 Emissions (t/year)	0.39	**DFEE**	80.15	**TFEE**	19.41
Compliance Check	See BREL	**% DFEE < TFEE**			-312.95
% DPER < TPER	-74.00	**DPER**	105.60	**TPER**	60.69

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	42.3800	(1b)	x 3.1000	(2b) =	131.3780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.3800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	131.3780	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1522	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6522	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5055	(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	0.6445	0.6319	0.6192	0.5560	0.5434	0.4802	0.4802	0.4676	0.5055	0.5434	0.5687	0.5939	(22b)
Effective ac	0.7077	0.6996	0.6917	0.6546	0.6476	0.6153	0.6153	0.6093	0.6278	0.6476	0.6617	0.6764	(25)

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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								
Ext Glazing - Resi New			5.0600	1.5038	7.6090			(27)
Ext Wall 1	15.8100	3.8300	11.9800	0.3000	3.5940			(29a)
Ext Wall 2	8.3100	1.2300	7.0800	0.3000	2.1240			(29a)
Total net area of external elements Aum(A, m2)			24.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.8670			(33)
Main dwelling								
Party Wall 1			67.0800	0.5000	33.5400			(32)
Party Floor 1			42.3800					(32d)
Party Ceiling 1			42.3800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	4.8240	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 51.6910	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.6814	30.3317	29.9890	28.3793	28.0781	26.6761	26.6761	26.4165	27.2162	28.0781	28.6874	29.3244	(38)
Heat transfer coeff	82.3724	82.0228	81.6800	80.0703	79.7692	78.3672	78.3672	78.1075	78.9072	79.7692	80.3784	81.0154	(39)

Average = Sum(39)m / 12 = 80.0689

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9437	1.9354	1.9273	1.8893	1.8822	1.8492	1.8492	1.8430	1.8619	1.8822	1.8966	1.9116	(40)
HLP (average)												1.8893	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4709 (42)

Hot water usage for mixer showers

70.5530	69.4928	67.9477	64.9916	62.8101	60.3772	58.9944	60.5277	62.2085	64.8207	67.8403	70.2827	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

29.6938	28.6140	27.5343	26.4545	25.3747	24.2949	24.2949	25.3747	26.4545	27.5343	28.6140	29.6938	(42c)

Average daily hot water use (litres/day) 92.0419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.2469	98.1068	95.4820	91.4461	88.1848	84.6721	83.2893	85.9024	88.6630	92.3549	96.4543	99.9765	(44)
Energy conte	158.7665	139.7028	146.7523	125.1851	118.7136	104.1143	100.7312	106.3651	109.3304	125.3248	137.4169	156.5391	(45)
Energy content (annual)											Total = Sum(45)m =	1528.9422	
Distribution loss (46)m = 0.15 x (45)m	23.8150	20.9554	22.0128	18.7778	17.8070	15.6171	15.1097	15.9548	16.3996	18.7987	20.6125	23.4809	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	237.8041	211.0916	225.7899	201.6731	197.7512	150.0263	148.1736	153.8075	155.2424	204.3624	213.9049	235.5767	(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	237.8041	211.0916	225.7899	201.6731	197.7512	150.0263	148.1736	153.8075	155.2424	204.3624	213.9049	235.5767	(64)
										Total per year (kWh/year) = Sum(64)m =		2335.2038	(64)
12Total per year (kWh/year)												2335	(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	96.6759	86.0902	92.6812	84.0945	83.3584	52.6276	52.1030	53.9763	54.3619	85.5566	88.1615	95.9353	(65)

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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	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.6883	74.9406	67.6883	69.9445	67.6883	69.9445	67.6883	67.6883	69.9445	67.6883	69.9445	67.6883	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	127.5623	128.8860	125.5503	118.4491	109.4850	101.0600	95.4317	94.1080	97.4436	104.5449	113.5089	121.9339	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	(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)	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	(71)
Water heating gains (Table 5)	129.9408	128.1104	124.5715	116.7979	112.0408	73.0939	70.0310	72.5488	75.5027	114.9954	122.4466	128.9453	(72)
Total internal gains	370.2553	377.0010	362.8741	350.2554	334.2780	289.1624	278.2149	279.4090	287.9548	332.2925	350.9640	363.6315	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2300	11.2829	0.4000	0.9000	0.7700	3.4623	(75)
Southwest	3.8300	36.7938	0.4000	0.9000	0.7700	35.1568	(79)

Solar gains	38.6191	66.9327	94.6349	122.3773	141.7462	142.7769	136.7966	122.0323	104.1929	74.7985	46.4662	32.9144	(83)
Total gains	408.8744	443.9336	457.5089	472.6327	476.0243	431.9393	415.0115	401.4413	392.1478	407.0910	397.4302	396.5459	(84)

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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	35.7287	35.8810	36.0315	36.7559	36.8947	37.5547	37.5547	37.6795	37.2977	36.8947	36.6150	36.3271	
alpha	3.3819	3.3921	3.4021	3.4504	3.4596	3.5036	3.5036	3.5120	3.4865	3.4596	3.4410	3.4218	
util living area	0.9883	0.9834	0.9755	0.9551	0.9104	0.8321	0.7011	0.7334	0.8844	0.9547	0.9814	0.9895	(86)
Living	19.2987	19.4421	19.6830	20.0457	20.3946	20.6729	20.8215	20.8030	20.5797	20.1729	19.6961	19.2963	
Non living	18.4580	18.6037	18.8462	19.2189	19.5592	19.8290	19.9451	19.9362	19.7444	19.3487	18.8723	18.4681	
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	20.1297	19.4421	19.6830	20.0457	20.3946	20.6729	20.8215	20.8030	20.5797	20.1729	19.6961	19.5346	(87)
Th 2	20.0282	20.0323	20.0363	20.0553	20.0589	20.0754	20.0754	20.0785	20.0691	20.0589	20.0517	20.0442	(88)
util rest of house													
	0.9861	0.9801	0.9703	0.9444	0.8853	0.7754	0.5956	0.6350	0.8423	0.9418	0.9772	0.9875	(89)
MIT 2	19.2250	18.6037	18.8462	19.2189	19.5592	19.8290	19.9451	19.9362	19.7444	19.3487	18.8723	18.6886	(90)
Living area fraction										fLA = Living area / (4) =		0.4403	(91)
MIT	19.6233	18.9729	19.2146	19.5829	19.9271	20.2006	20.3310	20.3178	20.1122	19.7116	19.2350	19.0611	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6233	18.9729	19.2146	19.5829	19.9271	20.2006	20.3310	20.3178	20.1122	19.7116	19.2350	19.0611	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9756	0.9646	0.9378	0.8812	0.7841	0.6276	0.6634	0.8446	0.9360	0.9725	0.9849	(94)
Useful gains	402.7212	433.0854	441.3325	443.2241	419.4684	338.6994	260.4691	266.3035	331.2085	381.0193	386.5056	390.5539	(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													
	1262.2177	1154.2967	1038.5313	855.3866	656.2650	438.9027	292.3869	306.0134	474.4075	726.8245	975.3918	1203.9761	(97)
Space heating kWh													
	639.4654	484.6540	444.3159	296.7571	176.1767	0.0000	0.0000	0.0000	0.0000	257.2791	423.9980	605.1861	(98a)
Space heating requirement - total per year (kWh/year)												3327.8322	
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													
	639.4654	484.6540	444.3159	296.7571	176.1767	0.0000	0.0000	0.0000	0.0000	257.2791	423.9980	605.1861	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3327.8322	
Space heating per m2											(98c) / (4) =	78.5236	(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 %)												229.4386	(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													
	639.4654	484.6540	444.3159	296.7571	176.1767	0.0000	0.0000	0.0000	0.0000	257.2791	423.9980	605.1861	(98)
Space heating efficiency (main heating system 1)													
	229.4386	229.4386	229.4386	229.4386	229.4386	0.0000	0.0000	0.0000	0.0000	229.4386	229.4386	229.4386	(210)
Space heating fuel (main heating system)													
	278.7087	211.2347	193.6535	129.3405	76.7860	0.0000	0.0000	0.0000	0.0000	112.1342	184.7980	263.7682	(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													
	237.8041	211.0916	225.7899	201.6731	197.7512	150.0263	148.1736	153.8075	155.2424	204.3624	213.9049	235.5767	(64)
Efficiency of water heater												175.1474	(216)
(217)m	175.1474	175.1474	175.1474	175.1474	175.1474	175.1474	175.1474	175.1474	175.1474	175.1474	175.1474	175.1474	(217)
Fuel for water heating, kWh/month													
	135.7737	120.5222	128.9142	115.1448	112.9056	85.6571	84.5994	87.8160	88.6353	116.6802	122.1285	134.5019	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	13.2927	10.6639	9.6016	7.0346	5.4337	4.4394	4.9568	6.4430	8.3689	10.9804	12.4024	13.6621	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1450.4236	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1474	
Water heating fuel used												1333.2788	(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)												107.2794	(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												2890.9819	(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	1450.4236	0.1542	223.6364	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1333.2788	0.1418	189.0598	(264)
Space and water heating			412.6962	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	107.2794	0.1443	15.4837	(268)
Total CO2, kg/year			428.1799	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.1000	(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	1450.4236	1.5708	2278.3577	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1333.2788	1.5244	2032.4388	(278)
Space and water heating			4310.7964	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	107.2794	1.5338	164.5487	(282)
Total Primary energy kWh/year			4475.3451	(286)
Dwelling Primary energy Rate (DPER)			105.6000	(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	42.3800	(1b)	x 3.1000	(2b) =	131.3780	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.3800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	131.3780	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1522 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4022 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3117 (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	0.3975	0.3897	0.3819	0.3429	0.3351	0.2961	0.2961	0.2884	0.3117	0.3351	0.3507	0.3663	(22b)
Effective ac	0.5790	0.5759	0.5729	0.5588	0.5561	0.5439	0.5439	0.5416	0.5486	0.5561	0.5615	0.5671	(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 Opening Type			5.0600	1.1450	5.7939			(27)
Ext Wall 1	15.8100	3.8300	11.9800	0.1800	2.1564			(29a)
Ext Wall 2	8.3100	1.2300	7.0800	0.1800	1.2744			(29a)
Total net area of external elements Aum(A, m2)			24.1200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.2247			(33)
Main dwelling								
Party Wall 1			67.0800	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							1.2060	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		10.4307	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.1018	24.9688	24.8385	24.2263	24.1117	23.5785	23.5785	23.4798	23.7839	24.1117	24.3434	24.5857	(38)

Heat transfer coeff												
	35.5325	35.3995	35.2692	34.6569	34.5424	34.0092	34.0092	33.9104	34.2146	34.5424	34.7741	35.0164 (39)
Average = Sum(39)m / 12 =												34.6564
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8384	0.8353	0.8322	0.8178	0.8151	0.8025	0.8025	0.8002	0.8073	0.8151	0.8205	0.8262 (40)
HLP (average)												0.8178
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4709 (42)
Hot water usage for mixer showers												
	62.7138	61.7714	60.3980	57.7703	55.8312	53.6686	52.4394	53.8024	55.2965	57.6184	60.3025	62.4735 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	29.6938	28.6140	27.5343	26.4545	25.3747	24.2949	24.2949	25.3747	26.4545	27.5343	28.6140	29.6938 (42c)
Average daily hot water use (litres/day)												84.8144 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	92.4076	90.3854	87.9323	84.2248	81.2059	77.9636	76.7344	79.1771	81.7510	85.1526	88.9165	92.1673 (44)
Energy conte	146.3511	128.7076	135.1486	115.2996	109.3187	95.8653	92.8036	98.0378	100.8071	115.5513	126.6779	144.3118 (45)
Energy content (annual)										Total = Sum(45)m =		1408.8804
Distribution loss (46)m = 0.15 x (45)m												
	21.9527	19.3061	20.2723	17.2949	16.3978	14.3798	13.9205	14.7057	15.1211	17.3327	19.0017	21.6468 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	192.9460	170.7933	181.7435	160.3914	155.9136	140.9571	139.3985	144.6327	145.8990	162.1462	171.7697	190.9067 (62)
WWHRS	-28.6701	-25.3561	-26.5515	-21.9857	-20.4898	-17.5333	-16.4347	-17.4766	-18.1406	-21.3858	-24.2275	-28.1392 (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												
	164.2759	145.4372	155.1921	138.4057	135.4238	123.4238	122.9638	127.1561	127.7583	140.7604	147.5422	162.7675 (64)
										Total per year (kWh/year) = Sum(64)m =		1691.1069 (64)
12Total per year (kWh/year)												1691 (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												
	85.9377	76.4638	82.2128	74.4106	73.6244	67.9487	68.1331	69.8735	69.5918	75.6967	78.1939	85.2596 (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	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466	73.5466 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	71.4955	79.1557	71.4955	73.8787	71.4955	73.8787	71.4955	71.4955	73.8787	71.4955	73.8787	71.4955 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	127.5623	128.8860	125.5503	118.4491	109.4850	101.0600	95.4317	94.1080	97.4436	104.5449	113.5089	121.9339 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547	30.3547 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373	-58.8373 (71)
Water heating gains (Table 5)												
	115.5076	113.7855	110.5011	103.3480	98.9575	94.3732	91.5768	93.9160	96.6553	101.7429	108.6026	114.5962 (72)
Total internal gains												
	362.6294	369.8912	355.6109	343.7397	328.0020	314.3759	303.5679	304.5834	313.0416	325.8473	344.0542	356.0896 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2300	11.2829	0.6300	0.7000	0.7700	4.2413	(75)
Southwest	3.8300	36.7938	0.6300	0.7000	0.7700	43.0671	(79)

Solar gains	47.3084	81.9925	115.9277	149.9122	173.6391	174.9016	167.5759	149.4896	127.6364	91.6281	56.9211	40.3201 (83)
Total gains	409.9378	451.8837	471.5386	493.6519	501.6411	489.2775	471.1438	454.0730	440.6780	417.4754	400.9753	396.4097 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.8272	83.1384	83.4456	84.9197	85.2012	86.5371	86.5371	86.7890	86.0176	85.2012	84.6335	84.0480
alpha	6.5218	6.5426	6.5630	6.6613	6.6801	6.7691	6.7691	6.7859	6.7345	6.6801	6.6422	6.6032
util living area												
	0.9705	0.9451	0.9002	0.7890	0.6283	0.4438	0.3175	0.3434	0.5320	0.7962	0.9352	0.9747 (86)
MIT	20.4756	20.6167	20.7667	20.9196	20.9836	20.9986	20.9999	20.9998	20.9955	20.9277	20.7084	20.4573 (87)
Th 2	20.2202	20.2229	20.2255	20.2380	20.2403	20.2512	20.2512	20.2532	20.2470	20.2403	20.2356	20.2306 (88)

util rest of house													
	0.9630	0.9324	0.8789	0.7530	0.5810	0.3924	0.2635	0.2877	0.4755	0.7544	0.9185	0.9682	(89)
MIT 2	19.6321	19.8060	19.9855	20.1646	20.2280	20.2505	20.2511	20.2531	20.2444	20.1779	19.9300	19.6183	(90)
Living area fraction										fLA = Living area / (4) =		0.4403	(91)
MIT	20.0035	20.1629	20.3295	20.4971	20.5607	20.5799	20.5808	20.5819	20.5751	20.5080	20.2727	19.9877	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0035	20.1629	20.3295	20.4971	20.5607	20.5799	20.5808	20.5819	20.5751	20.5080	20.2727	19.9877	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9313	0.8820	0.7657	0.6012	0.4150	0.2873	0.3122	0.5003	0.7697	0.9194	0.9658	(94)
Useful gains	393.7880	420.8512	415.8873	377.9726	301.5691	203.0587	135.3635	141.7736	220.4647	321.3481	368.6427	382.8537	(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	557.9827	540.2999	487.7536	401.9185	306.0694	203.3710	135.3843	141.8099	221.5432	342.2469	458.0699	552.8286	(97)
Space heating kWh	122.1609	80.2696	53.4686	17.2411	3.3483	0.0000	0.0000	0.0000	0.0000	15.5487	64.3876	126.4613	(98a)
Space heating requirement - total per year (kWh/year)												482.8860	
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	122.1609	80.2696	53.4686	17.2411	3.3483	0.0000	0.0000	0.0000	0.0000	15.5487	64.3876	126.4613	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												482.8860	
Space heating per m2											(98c) / (4) =	11.3942	(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	122.1609	80.2696	53.4686	17.2411	3.3483	0.0000	0.0000	0.0000	0.0000	15.5487	64.3876	126.4613	(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)	132.3520	86.9659	57.9291	18.6794	3.6276	0.0000	0.0000	0.0000	0.0000	16.8459	69.7590	137.0112	(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	164.2759	145.4372	155.1921	138.4057	135.4238	123.4238	122.9638	127.1561	127.7583	140.7604	147.5422	162.7675	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.4052	82.7839	81.9277	80.7061	79.9956	79.8000	79.8000	79.8000	79.8000	80.6127	82.3353	83.5003	(217)
Fuel for water heating, kWh/month	196.9612	175.6830	189.4255	171.4936	169.2890	154.6665	154.0900	159.3435	160.0982	174.6132	179.1968	194.9305	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.8553	11.9175	10.7304	7.8616	6.0725	4.9613	5.5395	7.2005	9.3527	12.2713	13.8604	15.2682	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.7084	-21.5582	-32.2119	-37.7165	-42.0095	-39.7433	-39.3052	-36.4719	-31.6544	-25.3621	-16.4768	-12.6255	(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	-5.9758	-12.7844	-25.7977	-39.3026	-52.4887	-52.8899	-52.2199	-43.9340	-31.8674	-18.4119	-8.0239	-4.7062	(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	523.1701	(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	2079.7910	(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)	119.8912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-698.2459	(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	2110.6064	(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	523.1701	0.2100	109.8657	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2079.7910	0.2100	436.7561	(264)
Space and water heating			546.6218	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	119.8912	0.1443	17.3040	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.8436	0.1337	-46.7879	
PV Unit electricity exported	-348.4023	0.1255	-43.7251	
Total			-90.5129	(269)
Total CO2, kg/year			485.3422	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	523.1701	1.1300	591.1822	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2079.7910	1.1300	2350.1638	(278)
Space and water heating			2941.3460	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	119.8912	1.5338	183.8931	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.8436	1.4942	-522.7467	
PV Unit electricity exported	-348.4023	0.4607	-160.4952	
Total			-683.2419	(283)
Total Primary energy kWh/year			2572.0980	(286)
Target Primary Energy Rate (TPER)			60.6900	(287)

PROPOSED

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 04 - 2B3P			**Issued on Date**	20/08/2025
Assessment Reference	00001		**Prop Type Ref**		
Property	Wells Road				

SAP Rating	69 C	**DER**	8.56	**TER**	11.52
Environmental	94 A	**% DER < TER**			25.69
CO_2 Emissions (t/year)	0.47	**DFEE**	73.19	**TFEE**	29.36
Compliance Check	See BREL	**% DFEE < TFEE**			-149.24
% DPER < TPER	-46.05	**DPER**	88.56	**TPER**	60.64

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	61.4100	(1b)	x 3.1000	(2b) =	190.3710	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4100					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	190.3710	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1051	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6051	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5143	(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	0.6557	0.6429	0.6300	0.5657	0.5529	0.4886	0.4886	0.4757	0.5143	0.5529	0.5786	0.6043	(22b)
Effective ac	0.7150	0.7066	0.6985	0.6600	0.6528	0.6194	0.6194	0.6132	0.6323	0.6528	0.6674	0.6826	(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								
Ext Glazing - Resi New			9.0300	1.5038	13.5789			(27)
Ext Wall 1	44.5500	6.4500	38.1000	0.2600	9.9060			(29a)
Ext Wall 2	14.9700		14.9700	0.2600	3.8922			(29a)
Ext Wall 3	17.3000	2.5800	14.7200	0.2600	3.8272			(29a)
Total net area of external elements Aum(A, m2)			76.8200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4243			(33)
Main dwelling								
Party Wall 1			42.4400	0.5000	21.2200			(32)
Party Floor 1			42.3800					(32d)
Party Ceiling 1			42.3800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	15.3640	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	67.7883	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.9175	44.3931	43.8790	41.4644	41.0126	38.9095	38.9095	38.5201	39.7196	41.0126	41.9265	42.8820	(38)
Heat transfer coeff													

	112.7059	112.1814	111.6673	109.2527	108.8009	106.6979	106.6979	106.3084	107.5079	108.8009	109.7149	110.6703	(39)
Average = Sum(39)m / 12 =												109.2505	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8353	1.8268	1.8184	1.7791	1.7717	1.7375	1.7375	1.7311	1.7507	1.7717	1.7866	1.8022	(40)
HLP (average)												1.7790	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0212	(42)
Hot water usage for mixer showers													
	83.9314	82.6701	80.8321	77.3154	74.7202	71.8260	70.1810	72.0051	74.0046	77.1121	80.7043	83.6098	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	35.3292	34.0445	32.7598	31.4751	30.1904	28.9057	28.9057	30.1904	31.4751	32.7598	34.0445	35.3292	(42c)
Average daily hot water use (litres/day)												109.4994	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	119.2606	116.7146	113.5919	108.7905	104.9106	100.7317	99.0867	102.1955	105.4797	109.8719	114.7488	118.9390	(44)
Energy conte	188.8796	166.2000	174.5865	148.9288	141.2298	123.8614	119.8367	126.5393	130.0670	149.0951	163.4807	186.2298	(45)
Energy content (annual)										Total = Sum(45)m =		1818.9347	
Distribution loss (46)m = 0.15 x (45)m													
	28.3319	24.9300	26.1880	22.3393	21.1845	18.5792	17.9755	18.9809	19.5101	22.3643	24.5221	27.9345	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	267.9172	237.5888	253.6241	225.4168	220.2674	169.7734	167.2791	173.9817	175.9790	228.1327	239.9687	265.2674	(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													
	267.9172	237.5888	253.6241	225.4168	220.2674	169.7734	167.2791	173.9817	175.9790	228.1327	239.9687	265.2674	(64)
										Total per year (kWh/year) = Sum(64)m =		2625.1963	(64)
12Total per year (kWh/year)												2625	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	106.6886	94.9005	101.9361	91.9892	90.8450	59.1935	58.4556	60.6842	61.2569	93.4602	96.8277	105.8075	(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	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	90.2583	99.9289	90.2583	93.2669	90.2583	93.2669	90.2583	90.2583	93.2669	90.2583	93.2669	90.2583	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	176.4885	178.3199	173.7048	163.8799	151.4777	139.8214	132.0342	130.2028	134.8179	144.6428	157.0450	168.7013	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	(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)													
	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	(71)
Water heating gains (Table 5)													
	143.3986	141.2210	137.0109	127.7628	122.1035	82.2132	78.5694	81.5648	85.0790	125.6185	134.4829	142.2144	(72)
Total internal gains													
	463.4635	472.7879	454.2921	438.2277	417.1576	368.6196	354.1801	355.3441	366.4819	413.8378	438.1130	454.4921	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.4500	36.7938	0.4000	0.9000	0.7700	59.2066	(77)
Northwest	2.5800	11.2829	0.4000	0.9000	0.7700	7.2624	(81)

Solar gains	66.4690	115.6336	164.6223	214.7148	250.3012	252.8031	241.9348	214.7265	181.8661	129.5273	80.0538	56.5994	(83)
Total gains	529.9325	588.4215	618.9144	652.9425	667.4588	621.4227	596.1148	570.0706	548.3480	543.3651	518.1668	511.0915	(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	37.8382	38.0151	38.1901	39.0341	39.1962	39.9688	39.9688	40.1152	39.6676	39.1962	38.8697	38.5341	
alpha	3.5225	3.5343	3.5460	3.6023	3.6131	3.6646	3.6646	3.6743	3.6445	3.6131	3.5913	3.5689	
util living area													
	0.9917	0.9871	0.9793	0.9585	0.9113	0.8210	0.6837	0.7222	0.8851	0.9620	0.9862	0.9928	(86)
Living	19.3335	19.4847	19.7308	20.0968	20.4401	20.7117	20.8427	20.8245	20.6127	20.1987	19.7246	19.3317	
Non living	18.5353	18.6890	18.9369	19.3139	19.6487	19.9113	20.0126	20.0042	19.8224	19.4193	18.9444	18.5465	
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	20.1475	19.4847	19.7308	20.0968	20.4401	20.7117	20.8427	20.8245	20.6127	20.1987	19.7246	19.5651	(87)
Th 2	20.0823	20.0866	20.0908	20.1105	20.1141	20.1313	20.1313	20.1344	20.1247	20.1141	20.1067	20.0989	(88)
util rest of house													
	0.9901	0.9846	0.9750	0.9487	0.8872	0.7649	0.5830	0.6278	0.8448	0.9512	0.9831	0.9914	(89)
MIT 2	19.2909	18.6890	18.9369	19.3139	19.6487	19.9113	20.0126	20.0042	19.8224	19.4193	18.9444	18.7636	(90)
Living area fraction										fLA = Living area / (4) =		0.2526	(91)
MIT	19.5073	18.8900	19.1374	19.5116	19.8485	20.1135	20.2222	20.2114	20.0220	19.6162	19.1414	18.9661	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5073	18.8900	19.1374	19.5116	19.8485	20.1135	20.2222	20.2114	20.0220	19.6162	19.1414	18.9661	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9803	0.9691	0.9405	0.8786	0.7636	0.5946	0.6372	0.8391	0.9435	0.9786	0.9891	(94)
Useful gains	524.0438	576.8091	599.7726	614.1233	586.4441	474.5072	354.4717	363.2594	460.1068	512.6770	507.0906	505.5174	(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													
	1713.9471	1569.4191	1411.1859	1159.3505	886.5694	588.2744	386.4829	405.1859	636.6626	980.9678	1321.1228	1634.1642	(97)
Space heating kWh													
	885.2881	667.0340	603.6915	392.5636	223.2932	0.0000	0.0000	0.0000	0.0000	348.4084	586.1032	839.7132	(98a)
Space heating requirement - total per year (kWh/year)												4546.0952	
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													
	885.2881	667.0340	603.6915	392.5636	223.2932	0.0000	0.0000	0.0000	0.0000	348.4084	586.1032	839.7132	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4546.0952	
Space heating per m2											(98c) / (4) =	74.0286	(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 %)												213.1860	(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													
	885.2881	667.0340	603.6915	392.5636	223.2932	0.0000	0.0000	0.0000	0.0000	348.4084	586.1032	839.7132	(98)
Space heating efficiency (main heating system 1)													
	213.1860	213.1860	213.1860	213.1860	213.1860	0.0000	0.0000	0.0000	0.0000	213.1860	213.1860	213.1860	(210)
Space heating fuel (main heating system)													
	415.2656	312.8883	283.1760	184.1414	104.7410	0.0000	0.0000	0.0000	0.0000	163.4293	274.9258	393.8876	(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													
	267.9172	237.5888	253.6241	225.4168	220.2674	169.7734	167.2791	173.9817	175.9790	228.1327	239.9687	265.2674	(64)
Efficiency of water heater												168.3086	(216)
(217)m	168.3086	168.3086	168.3086	168.3086	168.3086	168.3086	168.3086	168.3086	168.3086	168.3086	168.3086	168.3086	(217)
Fuel for water heating, kWh/month													
	159.1822	141.1626	150.6899	133.9306	130.8712	100.8703	99.3884	103.3707	104.5574	135.5443	142.5766	157.6077	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	17.7250	14.2196	12.8032	9.3802	7.2455	5.9197	6.6096	8.5914	11.1594	14.6417	16.5378	18.2176	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.6605	-18.8765	-31.2454	-39.7350	-46.0641	-41.1358	-40.5204	-36.4525	-29.6978	-23.0207	-13.5044	-9.7687	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2132.4548	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												168.3086	
Water heating fuel used												1559.7518	(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)												143.0508	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-341.6819	(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												3493.5756	(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	2132.4548	0.1544	329.1782	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1559.7518	0.1418	221.1386	(264)
Space and water heating			550.3168	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	143.0508	0.1443	20.6467	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-341.6819	0.1328	-45.3662	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-45.3662	(269)
Total CO2, kg/year			525.5972	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.5600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2132.4548	1.5715	3351.1202	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1559.7518	1.5243	2377.5368	(278)
Space and water heating			5728.6571	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	143.0508	1.5338	219.4161	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-341.6819	1.4906	-509.3170	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-509.3170	(283)
Total Primary energy kWh/year			5438.7561	(286)
Dwelling Primary energy Rate (DPER)			88.5600	(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	61.4100	(1b) x	3.1000	(2b) =	190.3710	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.3710	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1051 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3551 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3018 (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	0.3848	0.3772	0.3697	0.3320	0.3244	0.2867	0.2867	0.2792	0.3018	0.3244	0.3395	0.3546	(22b)
Effective ac	0.5740	0.5712	0.5683	0.5551	0.5526	0.5411	0.5411	0.5390	0.5455	0.5526	0.5576	0.5629	(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 Opening Type			9.0300	1.1450	10.3397			(27)
Ext Wall 1	44.5500	6.4500	38.1000	0.1800	6.8580			(29a)
Ext Wall 2	14.9700		14.9700	0.1800	2.6946			(29a)
Ext Wall 3	17.3000	2.5800	14.7200	0.1800	2.6496			(29a)
Total net area of external elements Aum(A, m2)			76.8200					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 22.5419 (33)
Main dwelling
Party Wall 1 42.4400 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area) 3.8410 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 26.3829 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.0622	35.8816	35.7045	34.8731	34.7175	33.9933	33.9933	33.8592	34.2722	34.7175	35.0322	35.3612	(38)
Heat transfer coeff	62.4451	62.2645	62.0874	61.2559	61.1004	60.3762	60.3762	60.2421	60.6551	61.1004	61.4151	61.7441	(39)
Average = Sum(39)m / 12 =												61.2552	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0169	1.0139	1.0110	0.9975	0.9950	0.9832	0.9832	0.9810	0.9877	0.9950	1.0001	1.0054	(40)
HLP (average)												0.9975	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0212 (42)
Hot water usage for mixer showers

74.6057	73.4845	71.8507	68.7248	66.4179	63.8454	62.3831	64.0045	65.7819	68.5441	71.7371	74.3199	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

35.3292	34.0445	32.7598	31.4751	30.1904	28.9057	28.9057	30.1904	31.4751	32.7598	34.0445	35.3292	(42c)

Average daily hot water use (litres/day) 100.9014 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.9349	107.5290	104.6105	100.1999	96.6083	92.7510	91.2888	94.1949	97.2570	101.3038	105.7816	109.6490	(44)
Energy conte	174.1100	153.1199	160.7825	137.1687	130.0534	114.0482	110.4059	116.6330	119.9276	137.4684	150.7053	171.6839	(45)
Energy content (annual)										Total = Sum(45)m =		1676.1066	
Distribution loss (46)m = 0.15 x (45)m	26.1165	22.9680	24.1174	20.5753	19.5080	17.1072	16.5609	17.4949	17.9891	20.6203	22.6058	25.7526	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	225.0361	199.1176	211.7086	186.4520	180.9795	163.3315	161.3319	167.5590	169.2109	188.3944	199.9886	222.6100	(62)
WWHRS	-34.1066	-30.1642	-31.5862	-26.1546	-24.3752	-20.8580	-19.5510	-20.7906	-21.5805	-25.4410	-28.8216	-33.4750	(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	190.9294	168.9535	180.1224	160.2973	156.6043	142.4735	141.7809	146.7685	147.6304	162.9534	171.1670	189.1350	(64)
										Total per year (kWh/year) = Sum(64)m =		1958.8157	(64)
12Total per year (kWh/year)												1959	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	98.6324	87.7106	94.2010	85.0352	83.9836	77.3477	77.4508	79.5213	79.3026	86.4491	89.5362	97.8258	(65)

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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	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	101.0604	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.4967	104.6214	94.4967	97.6466	94.4967	97.6466	94.4967	94.4967	97.6466	94.4967	97.6466	94.4967	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.4885	178.3199	173.7048	163.8799	151.4777	139.8214	132.0342	130.2028	134.8179	144.6428	157.0450	168.7013	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	33.1060	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	-80.8483	(71)
Water heating gains (Table 5)	132.5705	130.5217	126.6143	118.1045	112.8812	107.4273	104.1006	106.8835	110.1424	116.1950	124.3558	131.4862	(72)
Total internal gains	459.8738	469.7810	451.1339	435.9491	415.1737	398.2134	383.9496	384.9011	395.9250	411.6526	435.3655	451.0024	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.4500	36.7938	0.6300	0.7000	0.7700	72.5281	(77)
Northwest	2.5800	11.2829	0.6300	0.7000	0.7700	8.8964	(81)

Solar gains	81.4245	141.6511	201.6623	263.0256	306.6190	309.6838	296.3701	263.0399	222.7859	158.6710	98.0660	69.3342	(83)
Total gains	541.2983	611.4321	652.7962	698.9747	721.7927	707.8972	680.3197	647.9410	618.7110	570.3236	533.4315	520.3366	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.2934	68.4915	68.6867	69.6191	69.7964	70.6335	70.6335	70.7908	70.3087	69.7964	69.4387	69.0687	
alpha	5.5529	5.5661	5.5791	5.6413	5.6531	5.7089	5.7089	5.7194	5.6872	5.6531	5.6292	5.6046	
util living area													
	0.9872	0.9741	0.9480	0.8732	0.7329	0.5379	0.3894	0.4258	0.6509	0.8916	0.9722	0.9895	(86)
MIT	20.0904	20.2717	20.4960	20.7650	20.9295	20.9899	20.9986	20.9978	20.9715	20.7719	20.3987	20.0634	(87)
Th 2	20.0693	20.0718	20.0742	20.0854	20.0875	20.0974	20.0974	20.0992	20.0936	20.0875	20.0833	20.0788	(88)
util rest of house													
	0.9834	0.9668	0.9334	0.8408	0.6769	0.4656	0.3101	0.3434	0.5755	0.8565	0.9630	0.9863	(89)
MIT 2	19.0308	19.2597	19.5376	19.8609	20.0325	20.0920	20.0970	20.0985	20.0763	19.8773	19.4300	19.0040	(90)
Living area fraction										fLA = Living area / (4) =		0.2526	(91)
MIT	19.2984	19.5153	19.7797	20.0892	20.2590	20.3187	20.3247	20.3256	20.3024	20.1033	19.6746	19.2716	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2984	19.5153	19.7797	20.0892	20.2590	20.3187	20.3247	20.3256	20.3024	20.1033	19.6746	19.2716	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9613	0.9279	0.8410	0.6880	0.4836	0.3302	0.3643	0.5935	0.8572	0.9578	0.9827	(94)
Useful gains	530.1108	587.7602	605.7202	587.8217	496.5619	342.3166	224.6116	236.0143	367.1756	488.8888	510.9452	511.3203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	936.5779	910.0141	824.4996	685.4077	522.9595	345.2754	224.8828	236.4858	376.2068	580.6539	772.2732	930.5797	(97)
Space heating kWh													
	302.4116	216.5546	162.7719	70.2619	19.6398	0.0000	0.0000	0.0000	0.0000	68.2732	188.1562	311.9290	(98a)
Space heating requirement - total per year (kWh/year)												1339.9982	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	302.4116	216.5546	162.7719	70.2619	19.6398	0.0000	0.0000	0.0000	0.0000	68.2732	188.1562	311.9290	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1339.9982	
Space heating per m2											(98c) / (4) =	21.8205	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	302.4116	216.5546	162.7719	70.2619	19.6398	0.0000	0.0000	0.0000	0.0000	68.2732	188.1562	311.9290	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	327.6398	234.6204	176.3509	76.1234	21.2783	0.0000	0.0000	0.0000	0.0000	73.9688	203.8528	337.9513	(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													
	190.9294	168.9535	180.1224	160.2973	156.6043	142.4735	141.7809	146.7685	147.6304	162.9534	171.1670	189.1350	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0862	84.6175	83.8333	82.3433	80.7116	79.8000	79.8000	79.8000	79.8000	82.2617	84.2725	85.1740	(217)
Fuel for water heating, kWh/month													
	224.3954	199.6672	214.8577	194.6696	194.0296	178.5383	177.6703	183.9204	185.0005	198.0914	203.1114	222.0571	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.6346	15.7516	14.1825	10.3907	8.0261	6.5574	7.3217	9.5170	12.3616	16.2191	18.3195	20.1803	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.0114	-30.6396	-45.5403	-53.0124	-58.7458	-55.4270	-54.7704	-50.9399	-44.4235	-35.8628	-23.4666	-18.0503	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9607	-19.1239	-38.5175	-58.5906	-78.1851	-78.8015	-77.8524	-65.5708	-47.6216	-27.5671	-12.0357	-7.0639	(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												1451.7857	(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												2376.0089	(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)												158.4621	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1011.7810	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)

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Appendix Q - special features

Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3060.4757	(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	1451.7857	0.2100	304.8750	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2376.0089	0.2100	498.9619	(264)
Space and water heating			803.8369	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.4621	0.1443	22.8710	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-491.8902	0.1339	-65.8488	
PV Unit electricity exported	-519.8908	0.1255	-65.2624	
Total			-131.1112	(269)
Total CO2, kg/year			707.5260	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1451.7857	1.1300	1640.5179	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2376.0089	1.1300	2684.8901	(278)
Space and water heating			4325.4079	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.4621	1.5338	243.0544	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-491.8902	1.4947	-735.2362	
PV Unit electricity exported	-519.8908	0.4608	-239.5491	
Total			-974.7853	(283)
Total Primary energy kWh/year			3723.7779	(286)
Target Primary Energy Rate (TPER)			60.6400	(287)

PROPOSED

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elmhurst energy

Property Reference	Flat 05 - 1B1P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	69 C	**DER**	10.67	**TER**	14.95
Environmental	93 A	**% DER < TER**			28.63
CO_2 Emissions (t/year)	0.38	**DFEE**	94.07	**TFEE**	34.20
Compliance Check	See BREL	**% DFEE < TFEE**			-175.07
% DPER < TPER	-39.32	**DPER**	110.70	**TPER**	79.46

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.3900	(1b)	x 3.1000	(2b) =	122.1090	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3900					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	122.1090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1638 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6638 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5642 (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	0.7194	0.7053	0.6912	0.6206	0.6065	0.5360	0.5360	0.5219	0.5642	0.6065	0.6347	0.6630	(22b)
Effective ac	0.7588	0.7487	0.7389	0.6926	0.6839	0.6437	0.6437	0.6362	0.6592	0.6839	0.7015	0.7198	(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								
Ext Glazing - Resi New			6.2200	1.5038	9.3534			(27)
Ext Wall 1	24.9600	5.2300	19.7300	0.2600	5.1298			(29a)
Ext Wall 2	15.1900	0.9900	14.2000	0.2600	3.6920			(29a)
External Roof 1	39.3900		39.3900	0.1600	6.3024			(30)
Total net area of external elements Aum(A, m2)			79.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.4726			(33)
Main dwelling								
Party Wall 1			39.9900	0.5000	19.9950			(32)
Party Floor 1			39.3900					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.9080 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	60.3806 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.5747	30.1698	29.7730	27.9089	27.5602	25.9366	25.9366	25.6360	26.5620	27.5602	28.2657	29.0033	(38)
Heat transfer coeff	90.9553	90.5504	90.1536	88.2895	87.9407	86.3172	86.3172	86.0165	86.9426	87.9407	88.6463	89.3839	(39)

Average = Sum(39)m / 12 = 88.2878

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.3091	2.2988	2.2887	2.2414	2.2326	2.1913	2.1913	2.1837	2.2072	2.2326	2.2505	2.2692	(40)
HLP (average)												2.2414	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3902 (42)

Hot water usage for mixer showers

68.5907	67.5599	66.0579	63.1840	61.0631	58.6979	57.3535	58.8442	60.4783	63.0178	65.9534	68.3279	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

28.8672	27.8175	26.7678	25.7181	24.6684	23.6186	23.6186	24.6684	25.7181	26.7678	27.8175	28.8672	(42c)

Average daily hot water use (litres/day) 89.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.4580	95.3775	92.8257	88.9021	85.7315	82.3166	80.9722	83.5126	86.1964	89.7856	93.7710	97.1952	(44)
Energy conte	154.3496	135.8162	142.6696	121.7025	115.4110	101.2178	97.9288	103.4060	106.2888	121.8382	133.5939	152.1841	(45)
Energy content (annual)										Total = Sum(45)m =		1486.4066	
Distribution loss (46)m = 0.15 x (45)m	23.1524	20.3724	21.4004	18.2554	17.3117	15.1827	14.6893	15.5109	15.9433	18.2757	20.0391	22.8276	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	233.3872	207.2050	221.7072	198.1905	194.4486	147.1298	145.3712	150.8484	152.2008	200.8758	210.0819	231.2217	(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	233.3872	207.2050	221.7072	198.1905	194.4486	147.1298	145.3712	150.8484	152.2008	200.8758	210.0819	231.2217	(64)
										Total per year (kWh/year) = Sum(64)m =		2292.6682	(64)
12Total per year (kWh/year)												2293	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.2073	84.7979	91.3237	82.9365	82.2602	51.6645	51.1713	52.9924	53.3506	84.3973	86.8904	94.4873	(65)

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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	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.8629	67.3839	60.8629	62.8916	60.8629	62.8916	60.8629	60.8629	62.8916	60.8629	62.8916	60.8629	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	120.0024	121.2476	118.1096	111.4292	102.9964	95.0708	89.7759	88.5307	91.6687	98.3491	106.7819	114.7075	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	(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)	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	(71)
Water heating gains (Table 5)	127.9668	126.1874	122.7469	115.1895	110.5648	71.7563	68.7786	71.2264	74.0981	113.4372	120.6811	126.9991	(72)
Total internal gains	352.6854	358.6722	345.5727	333.3637	318.2774	273.5720	263.2707	264.4732	272.5117	316.5024	334.2079	346.4228	(73)

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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	0.9900	11.2829	0.4000	0.9000	0.7700	2.7867	(75)
Southeast	5.2300	36.7938	0.4000	0.9000	0.7700	48.0079	(77)

Solar gains	50.7946	87.4476	122.1083	155.4192	177.8440	178.2125	171.1273	154.1444	133.6046	97.3112	61.0088	43.3605	(83)
Total gains	403.4799	446.1198	467.6810	488.7829	496.1214	451.7844	434.3979	418.6177	406.1163	413.8136	395.2167	389.7833	(84)

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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	30.0743	30.2088	30.3417	30.9824	31.1052	31.6903	31.6903	31.8011	31.4623	31.1052	30.8577	30.6030	
alpha	3.0050	3.0139	3.0228	3.0655	3.0737	3.1127	3.1127	3.1201	3.0975	3.0737	3.0572	3.0402	
util living area	0.9863	0.9803	0.9708	0.9485	0.9027	0.8269	0.7039	0.7355	0.8791	0.9502	0.9788	0.9877	(86)
Living	19.0086	19.1755	19.4561	19.8702	20.2692	20.5944	20.7743	20.7507	20.4851	20.0111	19.4622	19.0057	
Non living	18.0291	18.1987	18.4809	18.9069	19.2953	19.6106	19.7505	19.7393	19.5119	19.0514	18.5031	18.0414	
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	19.9813	19.1755	19.4561	19.8702	20.2692	20.5944	20.7743	20.7507	20.4851	20.0111	19.4622	19.2847	(87)
Th 2	19.8455	19.8506	19.8556	19.8793	19.8837	19.9043	19.9043	19.9081	19.8964	19.8837	19.8748	19.8654	(88)
util rest of house													
	0.9834	0.9761	0.9641	0.9352	0.8731	0.7619	0.5826	0.6230	0.8305	0.9348	0.9736	0.9851	(89)
MIT 2	18.9163	18.1987	18.4809	18.9069	19.2953	19.6106	19.7505	19.7393	19.5119	19.0514	18.5031	18.2965	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	19.3305	18.5786	18.8602	19.2816	19.6741	19.9932	20.1486	20.1327	19.8904	19.4247	18.8761	18.6808	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3305	18.5786	18.8602	19.2816	19.6741	19.9932	20.1486	20.1327	19.8904	19.4247	18.8761	18.6808	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9819	0.9700	0.9566	0.9264	0.8664	0.7681	0.6132	0.6495	0.8302	0.9268	0.9675	0.9817	(94)
Useful gains	396.1575	432.7489	447.3923	452.7901	429.8348	347.0017	266.3731	271.8874	337.1637	383.5152	382.3598	382.6385	(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													
	1367.1012	1238.6035	1114.3125	916.5856	701.2454	465.5295	306.3091	321.0708	503.4347	776.0476	1043.9069	1294.3539	(97)
Space heating kWh													
	722.3821	541.5343	496.1886	333.9328	201.9294	0.0000	0.0000	0.0000	0.0000	292.0441	476.3139	678.3162	(98a)
Space heating requirement - total per year (kWh/year)												3742.6415	
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													
	722.3821	541.5343	496.1886	333.9328	201.9294	0.0000	0.0000	0.0000	0.0000	292.0441	476.3139	678.3162	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3742.6415	
Space heating per m2											(98c) / (4) =	95.0150	(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 %)	229.5170	(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													
	722.3821	541.5343	496.1886	333.9328	201.9294	0.0000	0.0000	0.0000	0.0000	292.0441	476.3139	678.3162	(98)
Space heating efficiency (main heating system 1)													
	229.5170	229.5170	229.5170	229.5170	229.5170	0.0000	0.0000	0.0000	0.0000	229.5170	229.5170	229.5170	(210)
Space heating fuel (main heating system)													
	314.7401	235.9452	216.1882	145.4937	87.9802	0.0000	0.0000	0.0000	0.0000	127.2429	207.5288	295.5407	(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													
	233.3872	207.2050	221.7072	198.1905	194.4486	147.1298	145.3712	150.8484	152.2008	200.8758	210.0819	231.2217	(64)
Efficiency of water heater												174.8513	(216)
(217)m	174.8513	174.8513	174.8513	174.8513	174.8513	174.8513	174.8513	174.8513	174.8513	174.8513	174.8513	174.8513	(217)
Fuel for water heating, kWh/month													
	133.4775	118.5036	126.7976	113.3480	111.2080	84.1457	83.1399	86.2724	87.0458	114.8838	120.1489	132.2391	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	11.9523	9.5886	8.6334	6.3252	4.8858	3.9917	4.4570	5.7934	7.5250	9.8732	11.1518	12.2845	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.8349	-12.7257	-21.1604	-27.1043	-31.6813	-28.2481	-27.8382	-24.9881	-20.2743	-15.6070	-9.0922	-6.5585	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1630.6598	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	174.8513	
Water heating fuel used	1311.2101	(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)	96.4618	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-233.1129	(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	2805.2188	(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	1630.6598	0.1541	251.3647	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1311.2101	0.1418	185.9354	(264)
Space and water heating			437.3001	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	96.4618	0.1443	13.9224	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-233.1129	0.1327	-30.9250	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-30.9250	(269)
Total CO2, kg/year			420.2975	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.6700	(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	1630.6598	1.5707	2561.2399	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1311.2101	1.5244	1998.8165	(278)
Space and water heating			4560.0564	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	96.4618	1.5338	147.9564	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-233.1129	1.4902	-347.3841	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-347.3841	(283)
Total Primary energy kWh/year			4360.6287	(286)
Dwelling Primary energy Rate (DPER)			110.7000	(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		39.3900	(1b)	x 3.1000	(2b) =	122.1090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3900						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		122.1090	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1638	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4138	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3517	(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	0.4484	0.4396	0.4309	0.3869	0.3781	0.3341	0.3341	0.3253	0.3517	0.3781	0.3957	0.4133	(22b)
Effective ac	0.6006	0.5966	0.5928	0.5748	0.5715	0.5558	0.5558	0.5529	0.5619	0.5715	0.5783	0.5854	(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 Opening Type			6.2200	1.1450	7.1221			(27)
Ext Wall 1	24.9600	5.2300	19.7300	0.1800	3.5514			(29a)
Ext Wall 2	15.1900	0.9900	14.2000	0.1800	2.5560			(29a)
External Roof 1	39.3900		39.3900	0.1100	4.3329			(30)
Total net area of external elements Aum(A, m2)			79.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5624			(33)

Main dwelling
Party Wall 1 39.9900 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area) 3.9770 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 21.5394 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.1998	24.0424	23.8882	23.1638	23.0283	22.3974	22.3974	22.2806	22.6404	23.0283	23.3025	23.5891	(38)
Heat transfer coeff	45.7392	45.5819	45.4276	44.7033	44.5678	43.9369	43.9369	43.8200	44.1799	44.5678	44.8419	45.1286	(39)
Average = Sum(39)m / 12 =												44.7026	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1612	1.1572	1.1533	1.1349	1.1314	1.1154	1.1154	1.1125	1.1216	1.1314	1.1384	1.1457	(40)
HLP (average)												1.1349	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3902 (42)
Hot water usage for mixer showers

60.9695	60.0533	58.7181	56.1635	54.2783	52.1759	50.9809	52.3060	53.7585	56.0158	58.6253	60.7359	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

28.8672	27.8175	26.7678	25.7181	24.6684	23.6186	23.6186	24.6684	25.7181	26.7678	27.8175	28.8672	(42c)

Average daily hot water use (litres/day) 82.4548 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	89.8368	87.8708	85.4859	81.8816	78.9467	75.7946	74.5996	76.9743	79.4766	82.7836	86.4428	89.6032	(44)
Energy conte	142.2795	125.1268	131.3887	112.0918	106.2774	93.1983	90.2217	95.3103	98.0026	112.3366	123.1536	140.2969	(45)
Energy content (annual)										Total = Sum(45)m =		1369.6842	
Distribution loss (46)m = 0.15 x (45)m	21.3419	18.7690	19.7083	16.8138	15.9416	13.9797	13.5333	14.2965	14.7004	16.8505	18.4730	21.0445	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	188.8744	167.2126	177.9836	157.1837	152.8723	138.2901	136.8166	141.9052	143.0944	158.9315	168.2454	186.8918	(62)
WWHRS	-27.8727	-24.6509	-25.8130	-21.3742	-19.9199	-17.0456	-15.9776	-16.9905	-17.6361	-20.7910	-23.5537	-27.3566	(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	161.0017	142.5617	152.1706	135.8095	132.9523	121.2445	120.8391	124.9147	125.4583	138.1405	144.6918	159.5352	(64)
									Total per year (kWh/year) = Sum(64)m =			1659.3199	(64)
12Total per year (kWh/year)												1659	(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	84.5839	75.2733	80.9627	73.3440	72.6132	67.0619	67.2746	68.9666	68.6593	74.6278	77.0220	83.9246	(65)

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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	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	69.5109	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3124	70.0959	63.3124	65.4229	63.3124	65.4229	63.3124	63.3124	65.4229	63.3124	65.4229	63.3124	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	120.0024	121.2476	118.1096	111.4292	102.9964	95.0708	89.7759	88.5307	91.6687	98.3491	106.7819	114.7075	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	29.9511	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	-55.6088	(71)
Water heating gains (Table 5)	113.6880	112.0138	108.8208	101.8667	97.5983	93.1415	90.4229	92.6970	95.3602	100.3062	106.9751	112.8019	(72)
Total internal gains	343.8561	350.2106	337.0961	325.5720	310.7605	297.4884	287.3646	288.3935	296.3050	308.8210	326.0331	337.6752	(73)

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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	0.9900	11.2829	0.6300	0.7000	0.7700	3.4137	(75)
Southeast	5.2300	36.7938	0.6300	0.7000	0.7700	58.8096	(77)

Solar gains	62.2234	107.1233	149.5827	190.3885	217.8589	218.3103	209.6309	188.8269	163.6656	119.2062	74.7358	53.1166	(83)
Total gains	406.0794	457.3339	486.6788	515.9605	528.6193	515.7987	496.9955	477.2204	459.9706	428.0272	400.7689	390.7918	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.8046	60.0111	60.2148	61.1905	61.3766	62.2579	62.2579	62.4239	61.9155	61.3766	61.0013	60.6139	
alpha	4.9870	5.0007	5.0143	5.0794	5.0918	5.1505	5.1505	5.1616	5.1277	5.0918	5.0668	5.0409	
util living area													
	0.9795	0.9624	0.9317	0.8546	0.7206	0.5340	0.3871	0.4195	0.6333	0.8672	0.9591	0.9825	(86)
MIT	20.0057	20.2017	20.4417	20.7272	20.9084	20.9842	20.9975	20.9962	20.9629	20.7480	20.3484	19.9808	(87)
Th 2	19.9512	19.9544	19.9576	19.9724	19.9752	19.9883	19.9883	19.9907	19.9832	19.9752	19.9696	19.9637	(88)
util rest of house													
	0.9735	0.9519	0.9129	0.8177	0.6597	0.4544	0.2991	0.3290	0.5515	0.8256	0.9459	0.9774	(89)
MIT 2	18.8341	19.0796	19.3746	19.7165	19.9049	19.9800	19.9875	19.9895	19.9613	19.7494	19.2767	18.8124	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	19.2898	19.5160	19.7896	20.1096	20.2952	20.3706	20.3803	20.3810	20.3509	20.1378	19.6935	19.2668	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2898	19.5160	19.7896	20.1096	20.2952	20.3706	20.3803	20.3810	20.3509	20.1378	19.6935	19.2668	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9687	0.9466	0.9094	0.8231	0.6796	0.4850	0.3334	0.3643	0.5820	0.8329	0.9416	0.9730	(94)
Useful gains	393.3774	432.9298	442.5961	424.6704	359.2567	250.1746	165.7042	173.8335	267.7256	356.5210	377.3769	380.2311	(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													
	685.6192	666.2236	603.7157	501.1059	383.0676	253.5417	166.0956	174.4488	276.1622	425.0769	564.7170	679.9442	(97)
Space heating kWh													
	217.4279	156.7734	119.8730	55.0335	17.7153	0.0000	0.0000	0.0000	0.0000	51.0056	134.8849	222.9866	(98a)
Space heating requirement - total per year (kWh/year)												975.7002	
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													
	217.4279	156.7734	119.8730	55.0335	17.7153	0.0000	0.0000	0.0000	0.0000	51.0056	134.8849	222.9866	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												975.7002	
Space heating per m2											(98c) / (4) =	24.7703	(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													
	217.4279	156.7734	119.8730	55.0335	17.7153	0.0000	0.0000	0.0000	0.0000	51.0056	134.8849	222.9866	(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)													
	235.5665	169.8521	129.8732	59.6246	19.1932	0.0000	0.0000	0.0000	0.0000	55.2607	146.1375	241.5889	(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													
	161.0017	142.5617	152.1706	135.8095	132.9523	121.2445	120.8391	124.9147	125.4583	138.1405	144.6918	159.5352	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7342	84.2734	83.5304	82.2025	80.7624	79.8000	79.8000	79.8000	79.8000	82.0423	83.9027	84.8108	(217)
Fuel for water heating, kWh/month													
	190.0078	169.1658	182.1739	165.2133	164.6215	151.9354	151.4274	156.5347	157.2160	168.3772	172.4519	188.1073	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.1551	10.5535	9.5022	6.9618	5.3775	4.3934	4.9055	6.3764	8.2823	10.8668	12.2740	13.5207	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.7039	-20.1064	-30.0781	-35.2677	-39.3328	-37.2360	-36.8268	-34.1444	-29.5955	-23.6734	-15.3588	-11.7611	(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	-5.5210	-11.8132	-23.8388	-36.3175	-48.4983	-48.8618	-48.2410	-40.5887	-29.4447	-17.0122	-7.4133	-4.3478	(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												1057.0967	(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												2017.2323	(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)												106.1690	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-648.9831	(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													

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Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2617.5148	(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	1057.0967	0.2100	221.9903	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2017.2323	0.2100	423.6188	(264)
Space and water heating			645.6091	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	106.1690	0.1443	15.3235	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-327.0850	0.1337	-43.7347	
PV Unit electricity exported	-321.8982	0.1255	-40.3995	
Total			-84.1342	(269)
Total CO2, kg/year			588.7276	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9500	(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	1057.0967	1.1300	1194.5192	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2017.2323	1.1300	2279.4725	(278)
Space and water heating			3473.9917	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	106.1690	1.5338	162.8456	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-327.0850	1.4941	-488.7046	
PV Unit electricity exported	-321.8982	0.4607	-148.2886	
Total			-636.9932	(283)
Total Primary energy kWh/year			3129.9449	(286)
Target Primary Energy Rate (TPER)			79.4600	(287)

PROPOSED

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elmhurst energy

Property Reference	Flat 06 - 1B1P			**Issued on Date**	20/08/2025
Assessment Reference	00001		**Prop Type Ref**		
Property	Wells Road				

SAP Rating	69 C	**DER**	10.44	**TER**	14.69
Environmental	94 A	**% DER < TER**			28.93
CO_2 Emissions (t/year)	0.38	**DFEE**	91.53	**TFEE**	33.87
Compliance Check	See BREL	**% DFEE < TFEE**			-170.28
% DPER < TPER	-38.66	**DPER**	108.28	**TPER**	78.09

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	40.4000	(1b)	x 3.1000	(2b) =	125.2400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.4000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.2400	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1597	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6597	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5607	(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	0.7149	0.7009	0.6869	0.6168	0.6028	0.5327	0.5327	0.5187	0.5607	0.6028	0.6308	0.6589	(22b)
Effective ac	0.7556	0.7456	0.7359	0.6902	0.6817	0.6419	0.6419	0.6345	0.6572	0.6817	0.6990	0.7171	(25)

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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								
Ext Glazing - Resi New			6.2200	1.5038	9.3534			(27)
Ext Wall 1	29.2600	5.2300	24.0300	0.3000	7.2090			(29a)
Ext Wall 2	3.4700	0.9900	2.4800	0.3000	0.7440			(29a)
Ext Wall 3	8.6800		8.6800	0.3000	2.6040			(29a)
External Roof 1	39.3900		39.3900	0.1600	6.3024			(30)
Total net area of external elements Aum(A, m2)			80.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.0228			(33)
Main dwelling								
Party Wall 1			35.6200	0.5000	17.8100			(32)
Party Floor 1			39.3900					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	16.1600	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 60.1828	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.2272	30.8170	30.4150	28.5266	28.1733	26.5286	26.5286	26.2241	27.1621	28.1733	28.8881	29.6353	(38)
Heat transfer coeff													

	91.4100	90.9998	90.5978	88.7094	88.3561	86.7114	86.7114	86.4068	87.3449	88.3561	89.0708	89.8181 (39)
Average = Sum(39)m / 12 =												88.7077
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.2626	2.2525	2.2425	2.1958	2.1870	2.1463	2.1463	2.1388	2.1620	2.1870	2.2047	2.2232 (40)
HLP (average)												2.1957
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4170 (42)
Hot water usage for mixer showers												
	69.2420	68.2015	66.6851	63.7839	61.6429	59.2553	57.8981	59.4030	61.0526	63.6162	66.5797	68.9767 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	29.1416	28.0819	27.0222	25.9625	24.9028	23.8431	23.8431	24.9028	25.9625	27.0222	28.0819	29.1416 (42c)
Average daily hot water use (litres/day)												90.3312 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	98.3836	96.2833	93.7073	89.7464	86.5457	83.0984	81.7412	84.3058	87.0151	90.6384	94.6616	98.1183 (44)
Energy conte	155.8156	137.1062	144.0247	122.8584	116.5072	102.1792	98.8590	104.3882	107.2983	122.9954	134.8628	153.6295 (45)
Energy content (annual)										Total = Sum(45)m =		1500.5242
Distribution loss (46)m = 0.15 x (45)m												
	23.3723	20.5659	21.6037	18.4288	17.4761	15.3269	14.8288	15.6582	16.0947	18.4493	20.2294	23.0444 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												0.7800 (55)
Total storage loss												
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800 (56)
If cylinder contains dedicated solar storage												
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	234.8532	208.4950	223.0623	199.3464	195.5448	148.0912	146.3014	151.8306	153.2103	202.0330	211.3508	232.6671 (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												
	234.8532	208.4950	223.0623	199.3464	195.5448	148.0912	146.3014	151.8306	153.2103	202.0330	211.3508	232.6671 (64)
										Total per year (kWh/year) = Sum(64)m =		2306.7858 (64)
12Total per year (kWh/year)												2307 (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												
	95.6948	85.2268	91.7743	83.3208	82.6247	51.9842	51.4805	53.3190	53.6863	84.7820	87.3123	94.9679 (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	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	62.3122	68.9885	62.3122	64.3892	62.3122	64.3892	62.3122	62.3122	64.3892	62.3122	64.3892	62.3122 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	122.5407	123.8123	120.6080	113.7862	105.1751	97.0818	91.6749	90.4034	93.6077	100.4294	109.0406	117.1339 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850 (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)												
	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803 (71)
Water heating gains (Table 5)												
	128.6220	126.8257	123.3525	115.7233	111.0547	72.2002	69.1942	71.6653	74.5643	113.9544	121.2670	127.6450 (72)
Total internal gains												
	357.7300	363.8816	350.5278	338.1539	322.7971	277.9264	267.4365	268.6359	276.8163	320.9511	338.9520	351.3462 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.9900	11.2829	0.4000	0.9000	0.7700	2.7867	(75)
Southeast	5.2300	36.7938	0.4000	0.9000	0.7700	48.0079	(77)

Solar gains	50.7946	87.4476	122.1083	155.4192	177.8440	178.2125	171.1273	154.1444	133.6046	97.3112	61.0088	43.3605 (83)
Total gains	408.5246	451.3292	472.6361	493.5731	500.6410	456.1388	438.5637	422.7804	410.4209	418.2622	399.9608	394.7067 (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	30.6920	30.8304	30.9672	31.6264	31.7528	32.3551	32.3551	32.4691	32.1204	31.7528	31.4980	31.2360
alpha	3.0461	3.0554	3.0645	3.1084	3.1169	3.1570	3.1570	3.1646	3.1414	3.1169	3.0999	3.0824
util living area												
	0.9867	0.9809	0.9716	0.9497	0.9041	0.8280	0.7042	0.7359	0.8802	0.9512	0.9794	0.9881 (86)
Living	19.0402	19.2051	19.4816	19.8904	20.2836	20.6040	20.7802	20.7573	20.4965	20.0292	19.4880	19.0377
Non living	18.0781	18.2457	18.5239	18.9447	19.3277	19.6386	19.7757	19.7648	19.5413	19.0870	18.5462	18.0907
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	19.9974	19.2051	19.4816	19.8904	20.2836	20.6040	20.7802	20.7573	20.4965	20.0292	19.4880	19.3122	(87)
Th 2	19.8687	19.8738	19.8787	19.9021	19.9065	19.9268	19.9268	19.9306	19.9190	19.9065	19.8976	19.8884	(88)
util rest of house													
	0.9840	0.9769	0.9652	0.9368	0.8753	0.7642	0.5850	0.6253	0.8326	0.9363	0.9744	0.9857	(89)
MIT 2	18.9527	18.2457	18.5239	18.9447	19.3277	19.6386	19.7757	19.7648	19.5413	19.0870	18.5462	18.3422	(90)
Living area fraction										fLA = Living area / (4) =		0.3475	(91)
MIT	19.3158	18.5791	18.8567	19.2733	19.6599	19.9741	20.1248	20.1097	19.8732	19.4145	18.8735	18.6793	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3158	18.5791	18.8567	19.2733	19.6599	19.9741	20.1248	20.1097	19.8732	19.4145	18.8735	18.6793	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9824	0.9708	0.9576	0.9275	0.8674	0.7675	0.6100	0.6466	0.8301	0.9277	0.9682	0.9822	(94)
Useful gains	401.3174	438.1505	452.5942	457.8005	434.2474	350.0854	267.5157	273.3745	340.7087	388.0315	387.2498	387.6862	(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													
	1372.5915	1244.7964	1119.4905	920.2114	703.3049	465.9964	305.6408	320.5461	504.2641	778.8113	1048.6758	1300.4996	(97)
Space heating kWh													
	722.6279	542.0660	496.1708	332.9359	200.1788	0.0000	0.0000	0.0000	0.0000	290.7402	476.2267	679.1332	(98a)
Space heating requirement - total per year (kWh/year)												3740.0796	
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													
	722.6279	542.0660	496.1708	332.9359	200.1788	0.0000	0.0000	0.0000	0.0000	290.7402	476.2267	679.1332	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3740.0796	
Space heating per m2											(98c) / (4) =	92.5762	(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 %)	229.5123	(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													
	722.6279	542.0660	496.1708	332.9359	200.1788	0.0000	0.0000	0.0000	0.0000	290.7402	476.2267	679.1332	(98)
Space heating efficiency (main heating system 1)													
	229.5123	229.5123	229.5123	229.5123	229.5123	0.0000	0.0000	0.0000	0.0000	229.5123	229.5123	229.5123	(210)
Space heating fuel (main heating system)													
	314.8537	236.1817	216.1849	145.0623	87.2192	0.0000	0.0000	0.0000	0.0000	126.6774	207.4951	295.9028	(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													
	234.8532	208.4950	223.0623	199.3464	195.5448	148.0912	146.3014	151.8306	153.2103	202.0330	211.3508	232.6671	(64)
Efficiency of water heater												174.8249	(216)
(217)m	174.8249	174.8249	174.8249	174.8249	174.8249	174.8249	174.8249	174.8249	174.8249	174.8249	174.8249	174.8249	(217)
Fuel for water heating, kWh/month													
	134.3362	119.2593	127.5918	114.0263	111.8518	84.7083	83.6845	86.8472	87.6364	115.5630	120.8928	133.0858	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	12.2369	9.8169	8.8390	6.4759	5.0021	4.0868	4.5631	5.9313	7.7042	10.1083	11.4173	12.5770	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.8381	-12.7343	-21.1794	-27.1356	-31.7261	-28.3438	-27.9318	-25.0651	-20.3291	-15.6200	-9.0973	-6.5612	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1629.5771	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	174.8249	
Water heating fuel used	1319.4833	(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)	98.7588	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-233.5617	(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	2814.2575	(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	1629.5771	0.1542	251.2354	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1319.4833	0.1418	187.1069	(264)
Space and water heating			438.3423	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	98.7588	0.1443	14.2539	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-233.5617	0.1326	-30.9804	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-30.9804	(269)
Total CO2, kg/year			421.6158	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1629.5771	1.5708	2559.6795	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1319.4833	1.5244	2011.4217	(278)
Space and water heating			4571.1012	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	98.7588	1.5338	151.4796	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-233.5617	1.4901	-348.0371	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-348.0371	(283)
Total Primary energy kWh/year			4374.5437	(286)
Dwelling Primary energy Rate (DPER)			108.2800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	40.4000	(1b) x	3.1000	(2b) =	125.2400	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	40.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2400	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1597 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4097 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3482 (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	0.4440	0.4353	0.4266	0.3831	0.3744	0.3308	0.3308	0.3221	0.3482	0.3744	0.3918	0.4092	(22b)
Effective ac	0.5986	0.5947	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5767	0.5837	(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 Opening Type			6.2200	1.1450	7.1221			(27)
Ext Wall 1	29.2600	5.2300	24.0300	0.1800	4.3254			(29a)
Ext Wall 2	3.4700	0.9900	2.4800	0.1800	0.4464			(29a)
Ext Wall 3	8.6800		8.6800	0.1800	1.5624			(29a)
External Roof 1	39.3900		39.3900	0.1100	4.3329			(30)

Total net area of external elements Aum(A, m2)						80.8000							(31)
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		17.7892					(33)
Main dwelling													
Party Wall 1						35.6200	0.0000	0.0000					(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)												4.0400	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		21.8292	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7384	24.5802	24.4252	23.6969	23.5606	22.9263	22.9263	22.8088	23.1706	23.5606	23.8363	24.1245	(38)
Heat transfer coeff	46.5677	46.4095	46.2544	45.5261	45.3898	44.7555	44.7555	44.6380	44.9998	45.3898	45.6655	45.9537	(39)
Average = Sum(39)m / 12 =												45.5255	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1527	1.1487	1.1449	1.1269	1.1235	1.1078	1.1078	1.1049	1.1139	1.1235	1.1303	1.1375	(40)
HLP (average)												1.1269	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4170	(42)
Hot water usage for mixer showers	61.5485	60.6235	59.2757	56.6968	54.7937	52.6714	51.4650	52.8027	54.2690	56.5477	59.1819	61.3126	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	29.1416	28.0819	27.0222	25.9625	24.9028	23.8431	23.8431	24.9028	25.9625	27.0222	28.0819	29.1416	(42c)
Average daily hot water use (litres/day)												83.2380	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6900	88.7054	86.2979	82.6593	79.6965	76.5145	75.3081	77.7054	80.2314	83.5699	87.2638	90.4542	(44)
Energy conte	143.6309	126.3153	132.6366	113.1565	107.2868	94.0835	91.0786	96.2156	98.9334	113.4036	124.3233	141.6295	(45)
Energy content (annual)											Total = Sum(45)m =	1382.6934	
Distribution loss (46)m = 0.15 x (45)m	21.5446	18.9473	19.8955	16.9735	16.0930	14.1125	13.6618	14.4323	14.8400	17.0105	18.6485	21.2444	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	190.2258	168.4010	179.2315	158.2483	153.8817	139.1753	137.6735	142.8105	144.0252	159.9985	169.4152	188.2244	(62)
WWHRS	-28.1374	-24.8849	-26.0581	-21.5771	-20.1091	-17.2075	-16.1293	-17.1519	-17.8035	-20.9884	-23.7773	-27.6163	(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	162.0884	143.5161	153.1734	136.6712	133.7726	121.9678	121.5443	125.6586	126.2217	139.0101	145.6378	160.6080	(64)
										Total per year (kWh/year) = Sum(64)m =		1669.8700	(64)
12Total per year (kWh/year)												1670	(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	85.0332	75.6684	81.3776	73.6980	72.9488	67.3562	67.5596	69.2676	68.9688	74.9826	77.4110	84.3677	(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	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	70.8504	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	64.9845	71.9471	64.9845	67.1506	64.9845	67.1506	64.9845	64.9845	67.1506	64.9845	67.1506	64.9845	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	122.5407	123.8123	120.6080	113.7862	105.1751	97.0818	91.6749	90.4034	93.6077	100.4294	109.0406	117.1339	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	30.0850	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	-56.6803	(71)
Water heating gains (Table 5)	114.2919	112.6018	109.3785	102.3583	98.0494	93.5503	90.8059	93.1016	95.7900	100.7831	107.5152	113.3975	(72)
Total internal gains	349.0722	355.6163	342.2260	330.5503	315.4641	302.0378	291.7204	292.7445	300.8035	313.4521	330.9616	342.7709	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	0.9900	11.2829	0.6300	0.7000	0.7700	3.4137	(75)
Southeast	5.2300	36.7938	0.6300	0.7000	0.7700	58.8096	(77)

Solar gains	62.2234	107.1233	149.5827	190.3885	217.8589	218.3103	209.6309	188.8269	163.6656	119.2062	74.7358	53.1166	(83)
Total gains	411.2956	462.7396	491.8087	520.9388	533.3229	520.3481	501.3513	481.5715	464.4691	432.6582	405.6973	395.8876	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.2469	60.4522	60.6549	61.6252	61.8102	62.6863	62.6863	62.8512	62.3459	61.8102	61.4371	61.0518	
alpha	5.0165	5.0301	5.0437	5.1083	5.1207	5.1791	5.1791	5.1901	5.1564	5.1207	5.0958	5.0701	
util living area	0.9803	0.9638	0.9341	0.8587	0.7260	0.5389	0.3909	0.4234	0.6382	0.8708	0.9606	0.9832	(86)
MIT	20.0068	20.2006	20.4389	20.7242	20.9069	20.9840	20.9975	20.9962	20.9624	20.7459	20.3474	19.9820	(87)
Th 2	19.9581	19.9612	19.9643	19.9789	19.9817	19.9945	19.9945	19.9968	19.9895	19.9817	19.9761	19.9704	(88)
util rest of house	0.9745	0.9537	0.9159	0.8225	0.6655	0.4593	0.3026	0.3327	0.5566	0.8299	0.9478	0.9783	(89)
MIT 2	18.8407	19.0837	19.3770	19.7194	19.9099	19.9861	19.9937	19.9956	19.9672	19.7532	19.2808	18.8189	(90)
Living area fraction										fLA = Living area / (4) =		0.3475	(91)
MIT	19.2459	19.4719	19.7460	20.0686	20.2564	20.3329	20.3425	20.3433	20.3131	20.0982	19.6515	19.2231	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2459	19.4719	19.7460	20.0686	20.2564	20.3329	20.3425	20.3433	20.3131	20.0982	19.6515	19.2231	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9695	0.9479	0.9114	0.8260	0.6827	0.4866	0.3333	0.3643	0.5837	0.8351	0.9428	0.9737	(94)
Useful gains	398.7456	438.6266	448.2358	430.2884	364.0831	253.1940	167.1173	175.4198	271.0892	361.3251	382.5014	385.4600	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	695.9970	676.2726	612.6864	508.4611	388.3737	256.5771	167.4993	176.0228	279.5868	431.1223	573.1704	690.3677	(97)
Space heating kWh	221.1551	159.6981	122.3513	56.2843	18.0722	0.0000	0.0000	0.0000	0.0000	51.9291	137.2817	226.8513	(98a)
Space heating requirement - total per year (kWh/year)												993.6230	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1551	159.6981	122.3513	56.2843	18.0722	0.0000	0.0000	0.0000	0.0000	51.9291	137.2817	226.8513	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												993.6230	
Space heating per m2											(98c) / (4) =	24.5946	(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	221.1551	159.6981	122.3513	56.2843	18.0722	0.0000	0.0000	0.0000	0.0000	51.9291	137.2817	226.8513	(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)	239.6046	173.0207	132.5582	60.9798	19.5798	0.0000	0.0000	0.0000	0.0000	56.2612	148.7342	245.7761	(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	162.0884	143.5161	153.1734	136.6712	133.7726	121.9678	121.5443	125.6586	126.2217	139.0101	145.6378	160.6080	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7571	84.2999	83.5608	82.2311	80.7743	79.8000	79.8000	79.8000	79.8000	82.0620	83.9275	84.8340	(217)
Fuel for water heating, kWh/month	191.2387	170.2446	183.3078	166.2039	165.6128	152.8419	152.3111	157.4669	158.1726	169.3964	173.5282	189.3203	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.5025	10.8322	9.7532	7.1456	5.5195	4.5095	5.0350	6.5447	8.5010	11.1537	12.5981	13.8778	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0398	-20.5907	-30.7891	-36.0835	-40.2252	-38.0724	-37.6524	-34.9177	-30.2785	-24.2347	-15.7318	-12.0503	(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	-5.6780	-12.1474	-24.5103	-37.3372	-49.8579	-50.2330	-49.5967	-41.7316	-30.2755	-17.4942	-7.6242	-4.4717	(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												1076.5147	(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												2029.6450	(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)												108.9728	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-665.6238	(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	2635.5087	(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	1076.5147	0.2100	226.0681	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2029.6450	0.2100	426.2255	(264)
Space and water heating			652.2935	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	108.9728	0.1443	15.7281	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-334.6661	0.1337	-44.7519	
PV Unit electricity exported	-330.9576	0.1255	-41.5370	
Total			-86.2889	(269)
Total CO2, kg/year			593.6621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1076.5147	1.1300	1216.4616	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2029.6450	1.1300	2293.4989	(278)
Space and water heating			3509.9605	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	108.9728	1.5338	167.1461	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-334.6661	1.4942	-500.0450	
PV Unit electricity exported	-330.9576	0.4607	-152.4639	
Total			-652.5089	(283)
Total Primary energy kWh/year			3154.6985	(286)
Target Primary Energy Rate (TPER)			78.0900	(287)

PROPOSED

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat 07 - 1B1P			**Issued on Date**	20/08/2025
Assessment Reference	00001		**Prop Type Ref**		
Property	Wells Road				

SAP Rating	69 C	**DER**	10.54	**TER**	13.24
Environmental	93 A	**% DER < TER**			20.39
CO_2 Emissions (t/year)	0.38	**DFEE**	93.58	**TFEE**	25.71
Compliance Check	See BREL	**% DFEE < TFEE**			-264.00
% DPER < TPER	-55.32	**DPER**	109.47	**TPER**	70.48

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		39.7800	(1b)	x 3.1000	(2b) =	123.3180	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.7800						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	123.3180	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1622	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.6622	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5132	(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	0.6543	0.6415	0.6287	0.5645	0.5517	0.4875	0.4875	0.4747	0.5132	0.5517	0.5773	0.6030	(22b)
Effective ac	0.7141	0.7058	0.6976	0.6593	0.6522	0.6188	0.6188	0.6127	0.6317	0.6522	0.6667	0.6818	(25)

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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								
Ext Glazing - Resi New			3.9200	1.5038	5.8947			(27)
Ext Wall 1	19.7500	3.9200	15.8300	0.3000	4.7490			(29a)
External Roof 1	39.3900		39.3900	0.1600	6.3024			(30)
Total net area of external elements Aum(A, m2)			59.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.5961			(33)
Main dwelling								
Party Wall 1			59.3000	0.5000	29.6500			(32)
Party Floor 1			39.3900					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	11.8280	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	58.4241	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0589	28.7206	28.3890	26.8316	26.5403	25.1838	25.1838	24.9326	25.7063	26.5403	27.1297	27.7460	(38)
Heat transfer coeff	87.4830	87.1448	86.8132	85.2558	84.9644	83.6079	83.6079	83.3567	84.1304	84.9644	85.5539	86.1701	(39)
Average = Sum(39)m / 12 =												85.2544	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1992	2.1907	2.1823	2.1432	2.1359	2.1018	2.1018	2.0954	2.1149	2.1359	2.1507	2.1662	(40)
HLP (average)												2.1431	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4005	(42)
Hot water usage for mixer showers													
	68.8407	67.8062	66.2986	63.4142	61.2856	58.9118	57.5626	59.0587	60.6987	63.2475	66.1938	68.5770	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	28.9725	27.9190	26.8654	25.8119	24.7583	23.7048	23.7048	24.7583	25.8119	26.8654	27.9190	28.9725	(42c)
Average daily hot water use (litres/day)												89.8075	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	97.8132	95.7251	93.1641	89.2261	86.0440	82.6166	81.2674	83.8170	86.5106	90.1129	94.1128	97.5495	(44)
Energy conte	154.9123	136.3113	143.1897	122.1461	115.8317	101.5868	98.2858	103.7830	106.6762	122.2823	134.0809	152.7389	(45)
Energy content (annual)										Total = Sum(45)m =		1491.8252	
Distribution loss (46)m = 0.15 x (45)m													
	23.2368	20.4467	21.4785	18.3219	17.3748	15.2380	14.7429	15.5674	16.0014	18.3424	20.1121	22.9108	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	233.9499	207.7001	222.2273	198.6341	194.8693	147.4988	145.7282	151.2254	152.5882	201.3199	210.5689	231.7765	(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													
	233.9499	207.7001	222.2273	198.6341	194.8693	147.4988	145.7282	151.2254	152.5882	201.3199	210.5689	231.7765	(64)
										Total per year (kWh/year) = Sum(64)m =		2298.0868	(64)
12Total per year (kWh/year)												2298	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.3944	84.9626	91.4967	83.0840	82.4001	51.7872	51.2900	53.1178	53.4794	84.5450	87.0523	94.6718	(65)

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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	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	66.9201	74.0901	66.9201	69.1508	66.9201	69.1508	66.9201	66.9201	69.1508	66.9201	69.1508	66.9201	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	120.9805	122.2359	119.0723	112.3375	103.8359	95.8457	90.5077	89.2523	92.4159	99.1507	107.6523	115.6425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	(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)													
	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	(71)
Water heating gains (Table 5)													
	128.2183	126.4324	122.9794	115.3944	110.7529	71.9267	68.9381	71.3948	74.2770	113.6357	120.9060	127.2470	(72)
Total internal gains													
	360.1264	366.7659	352.9793	340.8902	325.5164	280.9307	270.3735	271.5748	279.8512	323.7141	341.7166	353.8172	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.9200	36.7938	0.4000	0.9000	0.7700	35.9830	(79)

Solar gains	35.9830	61.2923	83.8628	103.9100	116.3879	115.5463	111.3989	102.0899	90.8057	67.7410	43.0993	30.7939	(83)
Total gains	396.1094	428.0582	436.8421	444.8003	441.9044	396.4769	381.7724	373.6647	370.6568	391.4551	384.8158	384.6111	(84)

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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	31.5776	31.7001	31.8212	32.4025	32.5136	33.0411	33.0411	33.1407	32.8359	32.5136	32.2896	32.0587	
alpha	3.1052	3.1133	3.1214	3.1602	3.1676	3.2027	3.2027	3.2094	3.1891	3.1676	3.1526	3.1372	
util living area													
	0.9873	0.9826	0.9757	0.9589	0.9232	0.8616	0.7477	0.7722	0.8980	0.9563	0.9805	0.9885	(86)
Living	19.0856	19.2322	19.4852	19.8672	20.2481	20.5707	20.7620	20.7406	20.4779	20.0303	19.5146	19.0815	
Non living	18.1475	18.2964	18.5511	18.9438	19.3174	19.6330	19.7877	19.7760	19.5465	19.1089	18.5934	18.1561	
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	20.0207	19.2322	19.4852	19.8672	20.2481	20.5707	20.7620	20.7406	20.4779	20.0303	19.5146	19.3499	(87)

Th 2	19.9004	19.9047	19.9088	19.9284	19.9321	19.9491	19.9491	19.9523	19.9426	19.9321	19.9247	19.9169	(88)
util rest of house	0.9847	0.9790	0.9702	0.9482	0.8991	0.8058	0.6340	0.6676	0.8558	0.9429	0.9758	0.9861	(89)
MIT 2	19.0037	18.2964	18.5511	18.9438	19.3174	19.6330	19.7877	19.7760	19.5465	19.1089	18.5934	18.4024	(90)
Living area fraction										fLA = Living area / (4) =		0.5040	(91)
MIT	19.5163	18.7680	19.0219	19.4092	19.7865	20.1056	20.2788	20.2622	20.0159	19.5733	19.0577	18.8799	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5163	18.7680	19.0219	19.4092	19.7865	20.1056	20.2788	20.2622	20.0159	19.5733	19.0577	18.8799	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9836	0.9741	0.9644	0.9418	0.8952	0.8155	0.6743	0.7029	0.8594	0.9372	0.9709	0.9833	(94)
Useful gains	389.6109	416.9825	421.2994	418.8966	395.5788	323.3364	257.4405	262.6427	318.5283	366.8714	373.6173	378.1750	(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	1331.1664	1208.5256	1087.0644	895.9696	687.0649	460.3156	307.5764	321.9383	497.7098	762.4116	1023.0300	1264.9728	(97)
Space heating kWh	700.5173	531.9170	495.3292	343.4925	216.8657	0.0000	0.0000	0.0000	0.0000	294.2818	467.5772	659.7776	(98a)
Space heating requirement - total per year (kWh/year)												3709.7583	
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	700.5173	531.9170	495.3292	343.4925	216.8657	0.0000	0.0000	0.0000	0.0000	294.2818	467.5772	659.7776	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3709.7583	
Space heating per m2											(98c) / (4) =	93.2569	(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 %)												229.4898	(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	700.5173	531.9170	495.3292	343.4925	216.8657	0.0000	0.0000	0.0000	0.0000	294.2818	467.5772	659.7776	(98)
Space heating efficiency (main heating system 1)	229.4898	229.4898	229.4898	229.4898	229.4898	0.0000	0.0000	0.0000	0.0000	229.4898	229.4898	229.4898	(210)
Space heating fuel (main heating system)	305.2498	231.7824	215.8393	149.6766	94.4991	0.0000	0.0000	0.0000	0.0000	128.2331	203.7463	287.4975	(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	233.9499	207.7001	222.2273	198.6341	194.8693	147.4988	145.7282	151.2254	152.5882	201.3199	210.5689	231.7765	(64)
Efficiency of water heater												174.9539	(216)
(217)m	174.9539	174.9539	174.9539	174.9539	174.9539	174.9539	174.9539	174.9539	174.9539	174.9539	174.9539	174.9539	(217)
Fuel for water heating, kWh/month	133.7209	118.7171	127.0205	113.5351	111.3833	84.3073	83.2952	86.4373	87.2163	115.0703	120.3568	132.4787	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	13.1418	10.5429	9.4927	6.9547	5.3720	4.3890	4.9006	6.3699	8.2739	10.8558	12.2616	13.5071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.8294	-12.7213	-21.1695	-27.1668	-31.8265	-28.2953	-27.8860	-25.0305	-20.3073	-15.6217	-9.0900	-6.5550	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1616.5240	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												174.9539	
Water heating fuel used												1313.5388	(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)												106.0620	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-233.4992	(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												2802.6257	(238)

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

	Energy	Emission factor	Emissions

Full SAP Calculation Printout

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	1616.5240	0.1539	248.8094	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1313.5388	0.1418	186.2650	(264)
Space and water heating			435.0744	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	106.0620	0.1443	15.3080	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-233.4992	0.1327	-30.9738	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-30.9738	(269)
Total CO2, kg/year			419.4087	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.5400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1616.5240	1.5698	2537.6461	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1313.5388	1.5244	2002.3639	(278)
Space and water heating			4540.0100	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	106.0620	1.5338	162.6814	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-233.4992	1.4902	-347.9501	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-347.9501	(283)
Total Primary energy kWh/year			4354.7413	(286)
Dwelling Primary energy Rate (DPER)			109.4700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.7800	(1b) x	3.1000	(2b) =	123.3180	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	123.3180	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1622	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4122	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3194	(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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3194	0.3434	0.3594	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704	(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 Opening Type			3.9200	1.1450	4.4885			(27)
Ext Wall 1	19.7500	3.9200	15.8300	0.1800	2.8494			(29a)
External Roof 1	39.3900		39.3900	0.1100	4.3329			(30)
Total net area of external elements Aum(A, m2)			59.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.6708			(33)
Main dwelling								
Party Wall 1			59.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)												2.9570	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	14.6278	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.7228	23.5917	23.4632	22.8598	22.7469	22.2213	22.2213	22.1240	22.4238	22.7469	22.9753	23.2141	(38)
Heat transfer coeff	38.3506	38.2196	38.0911	37.4877	37.3748	36.8492	36.8492	36.7519	37.0516	37.3748	37.6032	37.8419	(39)
Average = Sum(39)m / 12 =												37.4871	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9641	0.9608	0.9575	0.9424	0.9395	0.9263	0.9263	0.9239	0.9314	0.9395	0.9453	0.9513	(40)
HLP (average)												0.9424	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4005	(42)
Hot water usage for mixer showers	61.1917	60.2721	58.9321	56.3682	54.4761	52.3661	51.1667	52.4966	53.9544	56.2200	58.8389	60.9573	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	28.9725	27.9190	26.8654	25.8119	24.7583	23.7048	23.7048	24.7583	25.8119	26.8654	27.9190	28.9725	(42c)
Average daily hot water use (litres/day)												82.7554	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.1643	88.1911	85.7976	82.1801	79.2345	76.0709	74.8715	77.2550	79.7663	83.0854	86.7579	89.9298	(44)
Energy conte	142.7982	125.5830	131.8676	112.5005	106.6648	93.5380	90.5506	95.6578	98.3598	112.7461	123.6026	140.8084	(45)
Energy content (annual)											Total = Sum(45)m =	1374.6773	
Distribution loss (46)m = 0.15 x (45)m	21.4197	18.8374	19.7801	16.8751	15.9997	14.0307	13.5826	14.3487	14.7540	16.9119	18.5404	21.1213	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	189.3931	167.6687	178.4625	157.5923	153.2597	138.6299	137.1455	142.2527	143.4517	159.3410	168.6944	187.4033	(62)
WWHRS	-27.9743	-24.7407	-25.9070	-21.4521	-19.9925	-17.1078	-16.0358	-17.0525	-17.7004	-20.8668	-23.6395	-27.4563	(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	161.4188	142.9280	152.5555	136.1402	133.2672	121.5221	121.1097	125.2002	125.7513	138.4742	145.0549	159.9470	(64)
										Total per year (kWh/year) = Sum(64)m =		1663.3692	(64)
12Total per year (kWh/year)												1663	(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	84.7563	75.4249	81.1219	73.4799	72.7420	67.1749	67.3840	69.0821	68.7781	74.7640	77.1713	84.0947	(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	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	70.0250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.6795	78.2523	70.6795	73.0354	70.6795	73.0354	70.6795	70.6795	73.0354	70.6795	73.0354	70.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	120.9805	122.2359	119.0723	112.3375	103.8359	95.8457	90.5077	89.2523	92.4159	99.1507	107.6523	115.6425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	30.0025	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	-56.0200	(71)
Water heating gains (Table 5)	113.9198	112.2395	109.0348	102.0554	97.7715	93.2984	90.5699	92.8523	95.5252	100.4892	107.1824	113.0305	(72)
Total internal gains	352.5873	359.7351	345.7941	334.4358	319.2944	306.1871	295.7646	296.7916	304.9840	317.3269	334.8776	346.3600	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.9200	36.7938	0.6300	0.7000	0.7700	44.0791	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	44.0791	75.0831	102.7319	127.2898	142.5752	141.5442	136.4637	125.0601	111.2369	82.9828	52.7966	37.7225	(83)
Total gains	396.6664	434.8182	448.5260	461.7256	461.8696	447.7312	432.2283	421.8517	416.2209	400.3097	387.6743	384.0826	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													

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

tau	72.0327	72.2798	72.5235	73.6909	73.9135	74.9677	74.9677	75.1663	74.5581	73.9135	73.4646	73.0010	
alpha	5.8022	5.8187	5.8349	5.9127	5.9276	5.9978	5.9978	6.0111	5.9705	5.9276	5.8976	5.8667	
util living area													
	0.9754	0.9571	0.9265	0.8476	0.7124	0.5213	0.3745	0.3998	0.6009	0.8428	0.9492	0.9787	(86)
MIT	20.2928	20.4441	20.6181	20.8257	20.9481	20.9932	20.9992	20.9988	20.9844	20.8562	20.5670	20.2735	(87)
Th 2	20.1134	20.1162	20.1189	20.1316	20.1340	20.1452	20.1452	20.1473	20.1409	20.1340	20.1292	20.1241	(88)
util rest of house													
	0.9688	0.9461	0.9080	0.8131	0.6583	0.4541	0.3021	0.3262	0.5315	0.8015	0.9345	0.9730	(89)
MIT 2	19.3183	19.5067	19.7194	19.9677	20.0938	20.1415	20.1449	20.1469	20.1316	20.0064	19.6707	19.3029	(90)
Living area fraction										fLA = Living area / (4) =		0.5040	(91)
MIT	19.8095	19.9792	20.1723	20.4002	20.5244	20.5708	20.5755	20.5763	20.5614	20.4347	20.1224	19.7921	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8095	19.9792	20.1723	20.4002	20.5244	20.5708	20.5755	20.5763	20.5614	20.4347	20.1224	19.7921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9442	0.9093	0.8244	0.6834	0.4879	0.3386	0.3633	0.5660	0.8167	0.9344	0.9703	(94)
Useful gains	383.2179	410.5391	407.8373	380.6608	315.6216	218.4302	146.3469	153.2614	235.5817	326.9481	362.2296	372.6844	(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													
	594.7977	576.3198	520.7945	431.1144	329.8082	220.0194	146.4941	153.4856	239.4061	367.5700	489.6839	590.0358	(97)
Space heating kWh													
	157.4154	111.4046	84.0402	36.3266	10.5548	0.0000	0.0000	0.0000	0.0000	30.2227	91.7671	161.7094	(98a)
Space heating requirement - total per year (kWh/year)												683.4409	
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													
	157.4154	111.4046	84.0402	36.3266	10.5548	0.0000	0.0000	0.0000	0.0000	30.2227	91.7671	161.7094	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												683.4409	
Space heating per m2											(98c) / (4) =	17.1805	(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													
	157.4154	111.4046	84.0402	36.3266	10.5548	0.0000	0.0000	0.0000	0.0000	30.2227	91.7671	161.7094	(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)													
	170.5475	120.6984	91.0511	39.3571	11.4354	0.0000	0.0000	0.0000	0.0000	32.7440	99.4226	175.1998	(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													
	161.4188	142.9280	152.5555	136.1402	133.2672	121.5221	121.1097	125.2002	125.7513	138.4742	145.0549	159.9470	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0035	83.5073	82.7801	81.5407	80.3980	79.8000	79.8000	79.8000	79.8000	81.2758	83.0621	84.0844	(217)
Fuel for water heating, kWh/month													
	192.1572	171.1563	184.2900	166.9599	165.7593	152.2833	151.7666	156.8925	157.5831	170.3758	174.6343	190.2220	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.6858	11.7815	10.6079	7.7718	6.0032	4.9046	5.4763	7.1183	9.2460	12.1312	13.7022	15.0940	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.8532	-20.3282	-30.4081	-35.6462	-39.7422	-37.6169	-37.2102	-34.5157	-29.9306	-23.9431	-15.5298	-11.8894	(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	-5.5621	-11.9074	-24.0426	-36.6477	-48.9585	-49.3333	-48.6999	-40.9573	-29.6941	-17.1454	-7.4677	-4.3791	(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	740.4560 (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	2034.0803 (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)	118.5228 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-655.4087 (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	2323.6504 (238)

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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	740.4560	0.2100	155.4958	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2034.0803	0.2100	427.1569	(264)
Space and water heating			582.6526	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	118.5228	0.1443	17.1065	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-330.6137	0.1337	-44.2073	
PV Unit electricity exported	-324.7950	0.1255	-40.7587	
Total			-84.9660	(269)
Total CO2, kg/year			526.7224	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2400	(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	740.4560	1.1300	836.7153	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2034.0803	1.1300	2298.5108	(278)
Space and water heating			3135.2261	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	118.5228	1.5338	181.7942	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-330.6137	1.4941	-493.9799	
PV Unit electricity exported	-324.7950	0.4606	-149.6068	
Total			-643.5867	(283)
Total Primary energy kWh/year			2803.5344	(286)
Target Primary Energy Rate (TPER)			70.4800	(287)

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Property Reference	Flat 08 - 1B1P	**Issued on Date**	20/08/2025
Assessment Reference	00001	**Prop Type Ref**	
Property	Wells Road		

SAP Rating	69 C	**DER**	9.54	**TER**	11.49
Environmental	93 A	**% DER < TER**			16.97
CO_2 Emissions (t/year)	0.42	**DFEE**	91.93	**TFEE**	23.39
Compliance Check	See BREL	**% DFEE < TFEE**			-292.98
% DPER < TPER	-61.58	**DPER**	98.53	**TPER**	60.98

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	48.7700	(1b)	x 3.1000	(2b) =	151.1870	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.7700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	151.1870	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1323 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		10.0000 (17)
Infiltration rate		0.6323 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4900 (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	0.6248	0.6125	0.6003	0.5390	0.5268	0.4655	0.4655	0.4533	0.4900	0.5268	0.5513	0.5758	(22b)
Effective ac	0.6952	0.6876	0.6802	0.6453	0.6387	0.6084	0.6084	0.6027	0.6201	0.6387	0.6520	0.6658	(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								
Ext Glazing - Resi New			3.3000	1.5038	4.9624			(27)
Ext Wall 1	15.7500	3.3000	12.4500	0.3000	3.7350			(29a)
External Roof 1	48.7700		48.7700	0.1600	7.8032			(30)
Total net area of external elements Aum(A, m2)			64.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.5206			(33)
Main dwelling								
Party Wall 1			80.0400	0.5000	40.0200			(32)
Party Floor 1			48.7700					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	12.9040	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	69.4246	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6834	34.3053	33.9347	32.1938	31.8681	30.3519	30.3519	30.0711	30.9359	31.8681	32.5270	33.2159	(38)
Heat transfer coeff	104.1080	103.7299	103.3593	101.6184	101.2927	99.7765	99.7765	99.4957	100.3605	101.2927	101.9516	102.6405	(39)
Average = Sum(39)m / 12 =												101.6168	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1347	2.1269	2.1193	2.0836	2.0769	2.0459	2.0459	2.0401	2.0578	2.0769	2.0905	2.1046	(40)
HLP (average)												2.0836	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6540	(42)
Hot water usage for mixer showers													
	75.0027	73.8756	72.2331	69.0905	66.7714	64.1851	62.7150	64.3451	66.1319	68.9088	72.1189	74.7153	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	31.5681	30.4202	29.2723	28.1243	26.9764	25.8285	25.8285	26.9764	28.1243	29.2723	30.4202	31.5681	(42c)
Average daily hot water use (litres/day)												97.8483	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	106.5708	104.2958	101.5054	97.2149	93.7478	90.0136	88.5435	91.3215	94.2563	98.1811	102.5391	106.2835	(44)
Energy conte	168.7822	148.5158	156.0100	133.0823	126.2025	110.6822	107.0857	113.0751	116.2274	133.2308	146.0857	166.4142	(45)
Energy content (annual)										Total = Sum(45)m =		1625.3938	
Distribution loss (46)m = 0.15 x (45)m													
	25.3173	22.2774	23.4015	19.9623	18.9304	16.6023	16.0629	16.9613	17.4341	19.9846	21.9129	24.9621	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	247.8198	219.9046	235.0476	209.5703	205.2401	156.5942	154.5281	160.5175	162.1394	212.2684	222.5737	245.4518	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	247.8198	219.9046	235.0476	209.5703	205.2401	156.5942	154.5281	160.5175	162.1394	212.2684	222.5737	245.4518	(64)
										Total per year (kWh/year) = Sum(64)m =		2431.6554	(64)
12Total per year (kWh/year)												2432	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	100.0061	89.0205	95.7594	86.7203	85.8484	54.8114	54.2159	56.2074	56.6552	88.1853	91.0439	99.2188	(65)

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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	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	86.3034	95.5502	86.3034	89.1801	86.3034	89.1801	86.3034	86.3034	89.1801	86.3034	89.1801	86.3034	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.0398	145.5345	141.7680	133.7494	123.6274	114.1142	107.7588	106.2641	110.0307	118.0492	128.1712	137.6844	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	(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)													
	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	(71)
Water heating gains (Table 5)													
	134.4169	132.4710	128.7089	120.4448	115.3877	76.1270	72.8709	75.5476	78.6878	118.5287	126.4499	133.3586	(72)
Total internal gains													
	412.5694	421.3650	404.5895	391.1837	373.1278	327.2307	314.7423	315.9244	325.7079	370.6905	391.6105	405.1557	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.3000	36.7938	0.4000	0.9000	0.7700	30.2918	(79)

Solar gains	30.2918	51.5981	70.5988	87.4753	97.9796	97.2711	93.7797	85.9430	76.4435	57.0269	36.2826	25.9234	(83)
Total gains	442.8611	472.9631	475.1883	478.6590	471.1074	424.5017	408.5220	401.8674	402.1514	427.7174	427.8931	431.0791	(84)

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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	32.5317	32.6502	32.7673	33.3287	33.4358	33.9439	33.9439	34.0397	33.7464	33.4358	33.2197	32.9968	
alpha	3.1688	3.1767	3.1845	3.2219	3.2291	3.2629	3.2629	3.2693	3.2498	3.2291	3.2146	3.1998	
util living area													
	0.9902	0.9869	0.9822	0.9702	0.9436	0.8927	0.7922	0.8129	0.9204	0.9669	0.9850	0.9911	(86)
Living	19.0857	19.2192	19.4575	19.8265	20.2031	20.5378	20.7422	20.7201	20.4494	20.0023	19.5031	19.0823	
Non living	18.1724	18.3083	18.5486	18.9285	19.3007	19.6314	19.8031	19.7897	19.5468	19.1059	18.6056	18.1806	
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	20.0207	19.2192	19.4575	19.8265	20.2031	20.5378	20.7422	20.7201	20.4494	20.0023	19.5031	19.3506	(87)

Th 2	19.9327	19.9365	19.9403	19.9582	19.9615	19.9771	19.9771	19.9799	19.9711	19.9615	19.9548	19.9477	(88)
util rest of house	0.9882	0.9842	0.9781	0.9623	0.9250	0.8460	0.6872	0.7177	0.8857	0.9565	0.9814	0.9893	(89)
MIT 2	19.0322	18.3083	18.5486	18.9285	19.3007	19.6314	19.8031	19.7897	19.5468	19.1059	18.6056	18.4278	(90)
Living area fraction										fLA = Living area / (4) =		0.4132	(91)
MIT	19.4406	18.6847	18.9241	19.2995	19.6735	20.0059	20.1911	20.1741	19.9197	19.4763	18.9764	18.8090	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4406	18.6847	18.9241	19.2995	19.6735	20.0059	20.1911	20.1741	19.9197	19.4763	18.9764	18.8090	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9799	0.9730	0.9558	0.9186	0.8476	0.7130	0.7392	0.8835	0.9502	0.9769	0.9867	(94)
Useful gains	437.1322	463.4486	462.3618	457.5013	432.7482	359.8163	291.2745	297.0445	355.3138	406.4339	418.0023	425.3596	(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	1576.2601	1429.8848	1284.1508	1056.7791	807.6608	539.3818	358.3078	375.5068	584.0675	899.0999	1210.8189	1499.4782	(97)
Space heating kWh	847.5112	649.4451	611.4110	431.4800	278.9350	0.0000	0.0000	0.0000	0.0000	366.5435	570.8279	799.1442	(98a)
Space heating requirement - total per year (kWh/year)												4555.2980	
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	847.5112	649.4451	611.4110	431.4800	278.9350	0.0000	0.0000	0.0000	0.0000	366.5435	570.8279	799.1442	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4555.2980	
Space heating per m2											(98c) / (4) =	93.4037	(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 %)	228.3003	(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	847.5112	649.4451	611.4110	431.4800	278.9350	0.0000	0.0000	0.0000	0.0000	366.5435	570.8279	799.1442	(98)
Space heating efficiency (main heating system 1)	228.3003	228.3003	228.3003	228.3003	228.3003	0.0000	0.0000	0.0000	0.0000	228.3003	228.3003	228.3003	(210)
Space heating fuel (main heating system)	371.2265	284.4697	267.8100	188.9967	122.1790	0.0000	0.0000	0.0000	0.0000	160.5532	250.0338	350.0408	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	247.8198	219.9046	235.0476	209.5703	205.2401	156.5942	154.5281	160.5175	162.1394	212.2684	222.5737	245.4518	(64)
Efficiency of water heater												172.4799	(216)
(217)m	172.4799	172.4799	172.4799	172.4799	172.4799	172.4799	172.4799	172.4799	172.4799	172.4799	172.4799	172.4799	(217)
Fuel for water heating, kWh/month	143.6803	127.4957	136.2753	121.5042	118.9936	90.7898	89.5919	93.0644	94.0048	123.0685	129.0433	142.3075	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	16.9483	13.5966	12.2422	8.9692	6.9280	5.6603	6.3200	8.2150	10.6704	14.0002	15.8132	17.4194	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.8132	-26.7532	-43.5421	-54.3411	-61.9170	-52.2090	-51.4581	-46.9219	-39.0191	-32.1421	-19.2923	-14.1228	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1995.3097	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	172.4799	
Water heating fuel used	1409.8193	(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)	136.7826	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-458.5318	(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	3083.3798	(238)

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

	Energy	Emission factor	Emissions	

Full SAP Calculation Printout

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	1995.3097	0.1538	306.8011	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1409.8193	0.1418	199.9018	(264)
Space and water heating			506.7030	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	136.7826	0.1443	19.7419	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-458.5318	0.1335	-61.2058	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-61.2058	(269)
Total CO2, kg/year			465.2391	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.5400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1995.3097	1.5692	3131.1264	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1409.8193	1.5244	2149.0725	(278)
Space and water heating			5280.1988	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	136.7826	1.5338	209.8016	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-458.5318	1.4933	-684.7194	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-684.7194	(283)
Total Primary energy kWh/year			4805.2811	(286)
Dwelling Primary energy Rate (DPER)			98.5300	(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	48.7700	(1b) x	3.1000	(2b) =	151.1870	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.1870	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1323	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3823	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2963	(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	0.3777	0.3703	0.3629	0.3259	0.3185	0.2815	0.2815	0.2741	0.2963	0.3185	0.3333	0.3481	(22b)
Effective ac	0.5713	0.5686	0.5659	0.5531	0.5507	0.5396	0.5396	0.5376	0.5439	0.5507	0.5555	0.5606	(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 Opening Type			3.3000	1.1450	3.7786			(27)
Ext Wall 1	15.7500	3.3000	12.4500	0.1800	2.2410			(29a)
External Roof 1	48.7700		48.7700	0.1100	5.3647			(30)
Total net area of external elements Aum(A, m2)			64.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.3843			(33)
Main dwelling								
Party Wall 1			80.0400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)												3.2260	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	14.6103	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.5054	28.3672	28.2317	27.5954	27.4763	26.9220	26.9220	26.8194	27.1355	27.4763	27.7172	27.9690	(38)
Heat transfer coeff	43.1158	42.9775	42.8421	42.2057	42.0866	41.5324	41.5324	41.4297	41.7459	42.0866	42.3275	42.5793	(39)
Average = Sum(39)m / 12 =												42.2051	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8841	0.8812	0.8785	0.8654	0.8630	0.8516	0.8516	0.8495	0.8560	0.8630	0.8679	0.8731	(40)
HLP (average)												0.8654	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6540	(42)
Hot water usage for mixer showers	66.6691	65.6672	64.2072	61.4138	59.3523	57.0534	55.7467	57.1956	58.7839	61.2523	64.1057	66.4136	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	31.5681	30.4202	29.2723	28.1243	26.9764	25.8285	25.8285	26.9764	28.1243	29.2723	30.4202	31.5681	(42c)
Average daily hot water use (litres/day)												90.1650	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.2372	96.0874	93.4795	89.5381	86.3287	82.8819	81.5752	84.1720	86.9083	90.5245	94.5259	97.9818	(44)
Energy conte	155.5837	136.8271	143.6744	122.5732	116.2151	101.9130	98.6581	104.2226	107.1666	122.8409	134.6694	153.4158	(45)
Energy content (annual)											Total = Sum(45)m =	1497.7600	
Distribution loss (46)m = 0.15 x (45)m	23.3376	20.5241	21.5512	18.3860	17.4323	15.2869	14.7987	15.6334	16.0750	18.4261	20.2004	23.0124	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.1786	178.9128	190.2693	167.6651	162.8100	147.0048	145.2530	150.8175	152.2584	169.4358	179.7613	200.0107	(62)
WWHRS	-30.4783	-26.9553	-28.2260	-23.3722	-21.7821	-18.6391	-17.4712	-18.5788	-19.2847	-22.7346	-25.7555	-29.9139	(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	171.7003	151.9576	162.0433	144.2928	141.0279	128.3657	127.7818	132.2386	132.9737	146.7013	154.0058	170.0968	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.1856	(64)
12Total per year (kWh/year)												1763	(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	89.0075	79.1636	85.0477	76.8291	75.9174	69.9595	70.0797	71.9299	71.7064	78.1205	80.8511	88.2867	(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	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	82.6977	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.3200	99.9971	90.3200	93.3307	90.3200	93.3307	90.3200	90.3200	93.3307	90.3200	93.3307	90.3200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.0398	145.5345	141.7680	133.7494	123.6274	114.1142	107.7588	106.2641	110.0307	118.0492	128.1712	137.6844	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	31.2698	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	-66.1582	(71)
Water heating gains (Table 5)	119.6337	117.8030	114.3114	106.7070	102.0396	97.1660	94.1932	96.6800	99.5922	105.0007	112.2931	118.6649	(72)
Total internal gains	404.8029	414.1439	397.2087	384.5964	366.7963	352.4202	340.0813	341.0734	350.7628	364.1792	384.6043	397.4786	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	3.3000	36.7938	0.6300	0.7000	0.7700	37.1074	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	37.1074	63.2077	86.4835	107.1572	120.0250	119.1571	114.8801	105.2802	93.6433	69.8579	44.4461	31.7562	(83)
Total gains	441.9103	477.3516	483.6921	491.7537	486.8213	471.5773	454.9614	446.3536	444.4061	434.0372	429.0504	429.2348	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													

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

tau	78.5514	78.8041	79.0533	80.2452	80.4723	81.5462	81.5462	81.7482	81.1291	80.4723	80.0143	79.5411	
alpha	6.2368	6.2536	6.2702	6.3497	6.3648	6.4364	6.4364	6.4499	6.4086	6.3648	6.3343	6.3027	
util living area													
	0.9811	0.9674	0.9450	0.8797	0.7548	0.5574	0.4010	0.4260	0.6334	0.8678	0.9593	0.9836	(86)
MIT	20.3382	20.4681	20.6205	20.8190	20.9445	20.9932	20.9993	20.9989	20.9848	20.8584	20.5905	20.3215	(87)
Th 2	20.1811	20.1835	20.1859	20.1970	20.1991	20.2088	20.2088	20.2106	20.2051	20.1991	20.1949	20.1905	(88)
util rest of house													
	0.9759	0.9588	0.9305	0.8502	0.7042	0.4913	0.3293	0.3534	0.5664	0.8313	0.9473	0.9791	(89)
MIT 2	19.4298	19.5929	19.7815	20.0224	20.1548	20.2051	20.2086	20.2103	20.1957	20.0706	19.7554	19.4164	(90)
Living area fraction										fLA = Living area / (4) =		0.4132	(91)
MIT	19.8051	19.9545	20.1281	20.3515	20.4811	20.5307	20.5353	20.5361	20.5217	20.3961	20.1004	19.7903	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8051	19.9545	20.1281	20.3515	20.4811	20.5307	20.5353	20.5361	20.5217	20.3961	20.1004	19.7903	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9560	0.9293	0.8564	0.7227	0.5185	0.3589	0.3834	0.5936	0.8410	0.9457	0.9764	(94)
Useful gains	429.9830	456.3488	449.4910	421.1145	351.8278	244.5012	163.2975	171.1386	263.8113	365.0324	405.7530	419.0995	(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													
	668.5149	647.0034	583.8570	483.3195	369.5660	246.3152	163.4416	171.3585	268.0812	412.2861	550.2745	663.8261	(97)
Space heating kWh													
	177.4678	128.1199	99.9683	44.7876	13.1972	0.0000	0.0000	0.0000	0.0000	35.1568	104.0555	182.0766	(98a)
Space heating requirement - total per year (kWh/year)												784.8296	
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													
	177.4678	128.1199	99.9683	44.7876	13.1972	0.0000	0.0000	0.0000	0.0000	35.1568	104.0555	182.0766	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												784.8296	
Space heating per m2											(98c) / (4) =	16.0925	(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													
	177.4678	128.1199	99.9683	44.7876	13.1972	0.0000	0.0000	0.0000	0.0000	35.1568	104.0555	182.0766	(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)													
	192.2728	138.8081	108.3080	48.5239	14.2982	0.0000	0.0000	0.0000	0.0000	38.0897	112.7362	197.2661	(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													
	171.7003	151.9576	162.0433	144.2928	141.0279	128.3657	127.7818	132.2386	132.9737	146.7013	154.0058	170.0968	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1340	83.6796	83.0100	81.7629	80.4981	79.8000	79.8000	79.8000	79.8000	81.3948	83.2001	84.2127	(217)
Fuel for water heating, kWh/month													
	204.0796	181.5945	195.2095	176.4771	175.1940	160.8593	160.1276	165.7126	166.6337	180.2342	185.1028	201.9847	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.7667	15.0554	13.5557	9.9315	7.6714	6.2676	6.9981	9.0963	11.8153	15.5023	17.5098	19.2883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.8629	-24.6758	-36.7976	-42.9822	-47.7663	-45.1353	-44.6358	-41.4793	-36.0841	-28.9917	-18.8764	-14.4793	(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	-6.9400	-14.8449	-29.9587	-45.6496	-60.9802	-61.4651	-60.6893	-51.0500	-37.0154	-21.3825	-9.3185	-5.4657	(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												850.3029	(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												2153.2097	(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)												151.4581	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-803.5265	(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												2437.4442	(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	850.3029	0.2100	178.5636	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2153.2097	0.2100	452.1740	(264)
Space and water heating			630.7376	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.4581	0.1443	21.8601	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-398.7666	0.1338	-53.3505	
PV Unit electricity exported	-404.7598	0.1255	-50.7948	
Total			-104.1453	(269)
Total CO2, kg/year			560.3817	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	850.3029	1.1300	960.8423	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2153.2097	1.1300	2433.1269	(278)
Space and water heating			3393.9692	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.4581	1.5338	232.3115	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-398.7666	1.4944	-595.9230	
PV Unit electricity exported	-404.7598	0.4606	-186.4446	
Total			-782.3677	(283)
Total Primary energy kWh/year			2974.0138	(286)
Target Primary Energy Rate (TPER)			60.9800	(287)

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Property Reference	Flat 09 - 2B2P			**Issued on Date**	20/08/2025
Assessment Reference	00001		**Prop Type Ref**		
Property	Wells Road				

SAP Rating	69 C	**DER**	8.15	**TER**	11.20
Environmental	93 A	**% DER < TER**			27.23
CO_2 Emissions (t/year)	0.52	**DFEE**	82.51	**TFEE**	31.90
Compliance Check	See BREL	**% DFEE < TFEE**			-158.65
% DPER < TPER	-42.90	**DPER**	83.94	**TPER**	58.74

Assessor Details	[redacted]	**Assessor ID**	BQ15-0004
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	73.9000	(1b)	x 3.1000	(2b) =	229.0900	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.9000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	229.0900	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0873	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		10.0000	(17)
Infiltration rate		0.5873	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4552	(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	0.5803	0.5689	0.5576	0.5007	0.4893	0.4324	0.4324	0.4210	0.4552	0.4893	0.5121	0.5348	(22b)
Effective ac	0.6684	0.6619	0.6554	0.6253	0.6197	0.5935	0.5935	0.5886	0.6036	0.6197	0.6311	0.6430	(25)

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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								
Ext Glazing - Resi New			12.0300	1.5038	18.0902			(27)
Ext Wall 1	29.4500	6.4100	23.0400	0.2600	5.9904			(29a)
Ext Wall 2	2.7900		2.7900	0.2600	0.7254			(29a)
Ext Wall 3	26.5700	5.6200	20.9500	0.2600	5.4470			(29a)
External Roof 1	73.9000		73.9000	0.1600	11.8240			(30)
Total net area of external elements Aum(A, m2)			132.7100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		71.4320			(33)
Main dwelling								
Party Wall 1			58.7100	0.5000	29.3550			(32)
Party Floor 1			73.9000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	26.5420	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	97.9740	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	50.5301	50.0358	49.5512	47.2753	46.8495	44.8673	44.8673	44.5002	45.6308	46.8495	47.7109	48.6115	(38)
Heat transfer coeff													

	148.5041	148.0098	147.5252	145.2494	144.8236	142.8413	142.8413	142.4743	143.6049	144.8236	145.6850	146.5855	(39)
Average = Sum(39)m / 12 =												145.2473	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0095	2.0028	1.9963	1.9655	1.9597	1.9329	1.9329	1.9279	1.9432	1.9597	1.9714	1.9836	(40)
HLP (average)												1.9655	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3370	(42)
Hot water usage for mixer showers													
	91.6083	90.2316	88.2254	84.3871	81.5545	78.3956	76.6001	78.5911	80.7735	84.1652	88.0859	91.2573	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	38.5629	37.1606	35.7583	34.3560	32.9537	31.5515	31.5515	32.9537	34.3560	35.7583	37.1606	38.5629	(42c)
Average daily hot water use (litres/day)												119.5169	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	130.1711	127.3922	123.9838	118.7431	114.5083	109.9471	108.1516	111.5448	115.1295	119.9235	125.2466	129.8202	(44)
Energy conte	206.1593	181.4047	190.5584	162.5534	154.1501	135.1928	130.8000	138.1158	141.9662	162.7350	178.4367	203.2670	(45)
Energy content (annual)										Total = Sum(45)m =		1985.3394	
Distribution loss (46)m = 0.15 x (45)m													
	30.9239	27.2107	28.5838	24.3830	23.1225	20.2789	19.6200	20.7174	21.2949	24.4103	26.7655	30.4900	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.0000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.7800	(55)
Total storage loss													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(56)
If cylinder contains dedicated solar storage													
	24.1800	21.8400	24.1800	23.4000	24.1800	23.4000	24.1800	24.1800	23.4000	24.1800	23.4000	24.1800	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	285.1969	252.7935	269.5960	239.0414	233.1877	181.1048	178.2424	185.5582	187.8782	241.7726	254.9247	282.3046	(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													
	285.1969	252.7935	269.5960	239.0414	233.1877	181.1048	178.2424	185.5582	187.8782	241.7726	254.9247	282.3046	(64)
										Total per year (kWh/year) = Sum(64)m =		2791.6010	(64)
12Total per year (kWh/year)												2792	(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													
	112.4340	99.9561	107.2468	96.5194	95.1410	62.9612	62.1009	64.5334	65.2134	97.9955	101.8006	111.4724	(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	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	104.3261	115.5039	104.3261	107.8037	104.3261	107.8037	104.3261	104.3261	107.8037	104.3261	107.8037	104.3261	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.2232	208.3631	202.9705	191.4903	176.9986	163.3784	154.2793	152.1393	157.5319	169.0121	183.5039	197.1240	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	(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)													
	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	(71)
Water heating gains (Table 5)													
	151.1210	148.7442	144.1489	134.0547	127.8777	87.4461	83.4690	86.7385	90.5741	131.7144	141.3897	149.8284	(72)
Total internal gains													
	519.7248	530.6658	509.5000	491.4032	467.2569	416.6827	400.1289	401.2584	413.9642	463.1072	490.7518	509.3331	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.6200	36.7938	0.4000	0.9000	0.7700	51.5878	(77)
Southwest	6.4100	36.7938	0.4000	0.9000	0.7700	58.8395	(79)

Solar gains	110.4273	188.0985	257.3646	318.8872	357.1803	354.5973	341.8697	313.3013	278.6714	207.8889	132.2664	94.5027	(83)
Total gains	630.1521	718.7643	766.8646	810.2904	824.4371	771.2800	741.9985	714.5597	692.6357	670.9961	623.0182	603.8359	(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	34.5576	34.6730	34.7869	35.3320	35.4358	35.9276	35.9276	36.0202	35.7366	35.4358	35.2263	35.0099	
alpha	3.3038	3.3115	3.3191	3.3555	3.3624	3.3952	3.3952	3.4013	3.3824	3.3624	3.3484	3.3340	
util living area													
	0.9919	0.9867	0.9784	0.9585	0.9156	0.8332	0.7047	0.7383	0.8868	0.9623	0.9865	0.9930	(86)
Living	19.1620	19.3310	19.5982	19.9792	20.3472	20.6508	20.8087	20.7877	20.5509	20.0927	19.5734	19.1480	
Non living	18.2966	18.4673	18.7354	19.1237	19.4827	19.7729	19.8966	19.8855	19.6839	19.2402	18.7217	18.2928	
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	20.0597	19.3310	19.5982	19.9792	20.3472	20.6508	20.8087	20.7877	20.5509	20.0927	19.5734	19.4071	(87)
Th 2	19.9952	19.9986	20.0019	20.0173	20.0201	20.0335	20.0335	20.0360	20.0284	20.0201	20.0143	20.0082	(88)
util rest of house													
	0.9903	0.9840	0.9737	0.9482	0.8910	0.7749	0.5954	0.6368	0.8441	0.9510	0.9833	0.9916	(89)
MIT 2	19.1263	18.4673	18.7354	19.1237	19.4827	19.7729	19.8966	19.8855	19.6839	19.2402	18.7217	18.5327	(90)
Living area fraction										fLA = Living area / (4) =		0.2995	(91)
MIT	19.4058	18.7260	18.9938	19.3799	19.7416	20.0358	20.1697	20.1557	19.9435	19.4955	18.9767	18.7946	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4058	18.7260	18.9938	19.3799	19.7416	20.0358	20.1697	20.1557	19.9435	19.4955	18.9767	18.7946	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9891	0.9795	0.9675	0.9398	0.8825	0.7751	0.6127	0.6512	0.8396	0.9433	0.9788	0.9894	(94)
Useful gains	623.2939	704.0171	741.9201	761.4736	727.6020	597.7850	454.6480	465.2968	581.5169	632.9189	609.8241	597.4219	(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													
	2243.2753	2046.3786	1843.1478	1522.1963	1164.6066	776.4595	509.9027	535.0841	839.1585	1288.2717	1730.2615	2139.3519	(97)
Space heating kWh													
	1205.2662	902.0669	819.3134	547.7204	325.1314	0.0000	0.0000	0.0000	0.0000	487.5825	806.7149	1147.1960	(98a)
Space heating requirement - total per year (kWh/year)												6240.9917	
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													
	1205.2662	902.0669	819.3134	547.7204	325.1314	0.0000	0.0000	0.0000	0.0000	487.5825	806.7149	1147.1960	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6240.9917	
Space heating per m2											(98c) / (4) =	84.4518	(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 %)	231.6307 (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													
	1205.2662	902.0669	819.3134	547.7204	325.1314	0.0000	0.0000	0.0000	0.0000	487.5825	806.7149	1147.1960	(98)
Space heating efficiency (main heating system 1)													
	231.6307	231.6307	231.6307	231.6307	231.6307	0.0000	0.0000	0.0000	0.0000	231.6307	231.6307	231.6307	(210)
Space heating fuel (main heating system)													
	520.3396	389.4419	353.7154	236.4628	140.3663	0.0000	0.0000	0.0000	0.0000	210.4999	348.2763	495.2694	(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													
	285.1969	252.7935	269.5960	239.0414	233.1877	181.1048	178.2424	185.5582	187.8782	241.7726	254.9247	282.3046	(64)
Efficiency of water heater												169.9297	(216)
(217)m	169.9297	169.9297	169.9297	169.9297	169.9297	169.9297	169.9297	169.9297	169.9297	169.9297	169.9297	169.9297	(217)
Fuel for water heating, kWh/month													
	167.8323	148.7636	158.6515	140.6708	137.2260	106.5763	104.8918	109.1970	110.5623	142.2780	150.0177	166.1302	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	20.4876	16.4359	14.7987	10.8422	8.3748	6.8423	7.6398	9.9305	12.8987	16.9238	19.1154	21.0570	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.9760	-30.3597	-49.6212	-62.1316	-70.8417	-61.1748	-60.2491	-54.6790	-45.1836	-36.5638	-21.8360	-15.9256	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2694.3715 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	169.9297
Water heating fuel used	1642.7976 (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)	165.3469 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-527.5422 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3974.9738 (238)

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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	2694.3715	0.1542	415.5337	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1642.7976	0.1418	232.8948	(264)
Space and water heating			648.4285	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	165.3469	0.1443	23.8647	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-527.5422	0.1333	-70.3095	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-70.3095	(269)
Total CO2, kg/year			601.9836	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.1500	(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	2694.3715	1.5709	4232.7218	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1642.7976	1.5243	2504.0554	(278)
Space and water heating			6736.7772	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	165.3469	1.5338	253.6146	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-527.5422	1.4925	-787.3654	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-787.3654	(283)
Total Primary energy kWh/year			6203.0264	(286)
Dwelling Primary energy Rate (DPER)			83.9400	(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	73.9000	(1b) x	3.1000	(2b) =	229.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.0900	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1310 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3810 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2952 (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	0.3764	0.3690	0.3617	0.3248	0.3174	0.2805	0.2805	0.2731	0.2952	0.3174	0.3321	0.3469	(22b)
Effective ac	0.5708	0.5681	0.5654	0.5527	0.5504	0.5393	0.5393	0.5373	0.5436	0.5504	0.5552	0.5602	(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 Opening Type			12.0300	1.1450	13.7748			(27)
Ext Wall 1	29.4500	6.4100	23.0400	0.1800	4.1472			(29a)
Ext Wall 2	2.7900		2.7900	0.1800	0.5022			(29a)
Ext Wall 3	26.5700	5.6200	20.9500	0.1800	3.7710			(29a)
External Roof 1	73.9000		73.9000	0.1100	8.1290			(30)

Total net area of external elements Aum(A, m2)						132.7100							(31)
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		30.3242					(33)
Main dwelling													
Party Wall 1						58.7100	0.0000	0.0000					(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)												6.6355	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		36.9597	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1560	42.9481	42.7442	41.7866	41.6075	40.7735	40.7735	40.6190	41.0947	41.6075	41.9699	42.3488	(38)
Heat transfer coeff	80.1158	79.9078	79.7039	78.7463	78.5672	77.7332	77.7332	77.5787	78.0544	78.5672	78.9296	79.3085	(39)
Average = Sum(39)m / 12 =												78.7455	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0841	1.0813	1.0785	1.0656	1.0632	1.0519	1.0519	1.0498	1.0562	1.0632	1.0681	1.0732	(40)
HLP (average)												1.0656	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3370	(42)
Hot water usage for mixer showers	81.4296	80.2058	78.4226	75.0108	72.4929	69.6850	68.0890	69.8587	71.7987	74.8135	78.2986	81.1176	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	38.5629	37.1606	35.7583	34.3560	32.9537	31.5515	31.5515	32.9537	34.3560	35.7583	37.1606	38.5629	(42c)
Average daily hot water use (litres/day)												110.1325	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9925	117.3664	114.1809	109.3668	105.4466	101.2365	99.6405	102.8125	106.1547	110.5718	115.4592	119.6805	(44)
Energy conte	190.0387	167.1282	175.4918	149.7177	141.9515	124.4820	120.5065	127.3033	130.8993	150.0449	164.4928	187.3907	(45)
Energy content (annual)										Total = Sum(45)m =		1829.4475	
Distribution loss (46)m = 0.15 x (45)m	28.5058	25.0692	26.3238	22.4577	21.2927	18.6723	18.0760	19.0955	19.6349	22.5067	24.6739	28.1086	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	240.9648	213.1260	226.4179	199.0010	192.8775	173.7653	171.4326	178.2294	180.1826	200.9710	213.7761	238.3168	(62)
WWHRS	-37.2262	-32.9232	-34.4752	-28.5468	-26.6046	-22.7658	-21.3393	-22.6922	-23.5544	-27.7680	-31.4578	-36.5368	(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	203.7386	180.2028	191.9427	170.4541	166.2729	150.9996	150.0933	155.5372	156.6283	173.2030	182.3184	201.7799	(64)
									Total per year (kWh/year) = Sum(64)m =			2083.1707	(64)
12Total per year (kWh/year)												2083	(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	103.9287	92.3683	99.0919	89.2078	87.9397	80.8169	80.8093	83.0692	82.9507	90.6308	94.1205	103.0483	(65)

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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	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	116.8484	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.1524	119.7401	108.1524	111.7574	108.1524	111.7574	108.1524	108.1524	111.7574	108.1524	111.7574	108.1524	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.2232	208.3631	202.9705	191.4903	176.9986	163.3784	154.2793	152.1393	157.5319	169.0121	183.5039	197.1240	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	34.6848	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	-93.4787	(71)
Water heating gains (Table 5)	139.6892	137.4529	133.1880	123.8997	118.1985	112.2457	108.6146	111.6522	115.2093	121.8156	130.7229	138.5057	(72)
Total internal gains	515.1192	526.6106	505.3654	488.2019	464.4040	445.4361	429.1008	429.9984	442.5532	460.0346	487.0388	504.8367	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.6200	36.7938	0.6300	0.7000	0.7700	63.1951	(77)
Southwest	6.4100	36.7938	0.6300	0.7000	0.7700	72.0784	(79)

Solar gains	135.2734	230.4207	315.2716	390.6368	437.5458	434.3817	418.7903	383.7941	341.3725	254.6639	162.0264	115.7659	(83)
Total gains	650.3926	757.0313	820.6370	878.8387	901.9498	879.8178	847.8911	813.7925	783.9257	714.6986	649.0651	620.6025	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.0566	64.2234	64.3876	65.1706	65.3192	66.0200	66.0200	66.1514	65.7483	65.3192	65.0193	64.7086	
alpha	5.2704	5.2816	5.2925	5.3447	5.3546	5.4013	5.4013	5.4101	5.3832	5.3546	5.3346	5.3139	
util living area	0.9884	0.9741	0.9464	0.8744	0.7426	0.5538	0.4016	0.4357	0.6557	0.8932	0.9742	0.9907	(86)
MIT	19.9795	20.1934	20.4430	20.7283	20.9102	20.9849	20.9978	20.9966	20.9637	20.7366	20.3156	19.9444	(87)
Th 2	20.0138	20.0161	20.0184	20.0290	20.0310	20.0403	20.0403	20.0421	20.0367	20.0310	20.0270	20.0228	(88)
util rest of house	0.9849	0.9666	0.9312	0.8412	0.6846	0.4758	0.3150	0.3465	0.5763	0.8574	0.9655	0.9879	(89)
MIT 2	18.8489	19.1186	19.4275	19.7699	19.9609	20.0323	20.0397	20.0409	20.0148	19.7886	19.2831	18.8112	(90)
Living area fraction										fLA = Living area / (4) =		0.2995	(91)
MIT	19.1874	19.4404	19.7316	20.0569	20.2452	20.3176	20.3266	20.3271	20.2990	20.0725	19.5923	19.1505	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1874	19.4404	19.7316	20.0569	20.2452	20.3176	20.3266	20.3271	20.2990	20.0725	19.5923	19.1505	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9810	0.9611	0.9259	0.8423	0.6981	0.4988	0.3410	0.3732	0.5988	0.8592	0.9605	0.9845	(94)
Useful gains	638.0142	727.5801	759.8243	740.2079	629.6605	438.8743	289.1002	303.7200	469.4029	614.0542	623.4147	610.9590	(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	1192.7176	1161.8946	1054.6109	878.5646	671.3707	444.4450	289.6776	304.6585	483.8572	744.2289	986.0128	1185.7059	(97)
Space heating kWh	412.6993	291.8593	219.3212	99.6168	31.0324	0.0000	0.0000	0.0000	0.0000	96.8500	261.0706	427.6117	(98a)
Space heating requirement - total per year (kWh/year)												1840.0613	
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	412.6993	291.8593	219.3212	99.6168	31.0324	0.0000	0.0000	0.0000	0.0000	96.8500	261.0706	427.6117	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1840.0613	
Space heating per m2											(98c) / (4) =	24.8993	(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	412.6993	291.8593	219.3212	99.6168	31.0324	0.0000	0.0000	0.0000	0.0000	96.8500	261.0706	427.6117	(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)	447.1282	316.2072	237.6178	107.9272	33.6212	0.0000	0.0000	0.0000	0.0000	104.9296	282.8501	463.2846	(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	203.7386	180.2028	191.9427	170.4541	166.2729	150.9996	150.0933	155.5372	156.6283	173.2030	182.3184	201.7799	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6089	85.1347	84.3596	82.8991	81.0927	79.8000	79.8000	79.8000	79.8000	82.8100	84.8644	85.7013	(217)
Fuel for water heating, kWh/month	237.9877	211.6679	227.5292	205.6164	205.0406	189.2225	188.0868	194.9087	196.2760	209.1571	214.8349	235.4457	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.4719	18.0278	16.2320	11.8923	9.1859	7.5050	8.3797	10.8923	14.1480	18.5630	20.9668	23.0965	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.0867	-36.4790	-54.0635	-62.7371	-69.3364	-65.3316	-64.5341	-60.0962	-52.5409	-42.5864	-27.9736	-21.5613	(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	-10.9814	-23.4058	-47.0906	-71.5646	-95.4444	-96.1973	-95.0625	-80.1113	-58.2249	-33.7443	-14.7494	-8.6609	(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 1993.5659 (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 2515.7737 (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) 181.3613 (232)

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

PV generation -1217.5642 (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	3559.1366	(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	1993.5659	0.2100	418.6488	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2515.7737	0.2100	528.3125	(264)
Space and water heating			946.9613	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	181.3613	0.1443	26.1760	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.3267	0.1339	-77.9954	
PV Unit electricity exported	-635.2375	0.1256	-79.7553	
Total			-157.7507	(269)
Total CO2, kg/year			827.3159	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1993.5659	1.1300	2252.7295	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2515.7737	1.1300	2842.8242	(278)
Space and water heating			5095.5537	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	181.3613	1.5338	278.1780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.3267	1.4950	-870.5632	
PV Unit electricity exported	-635.2375	0.4608	-292.7466	
Total			-1163.3098	(283)
Total Primary energy kWh/year			4340.5227	(286)
Target Primary Energy Rate (TPER)			58.7400	(287)

6.0 APPENDIX – BRUKL OUTPUT (COMMERCIAL)

BASELINE

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

7741_Wells Road_Part-L_Baseline

As built

Date: Tue Aug 19 15:48:19 2025

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.28

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.28

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m^2]: 310.39

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

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	2.32	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	5.62	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	23.39	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	58.62	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.29	0.3	L000000C:Surf[0]
Floors	0.18	0.25	0.25	L0000005:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	L000000C:Surf[10]
Windows** and roof windows	1.6	1.6	1.6	L000000C:Surf[1]
Rooflights***	2.2	2	2	L000000C:Surf[9]
Personnel doors^	1.6	2.2	2.2	L000000B:Surf[2]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

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

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

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

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

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

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	10

BASELINE

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Electric Rads

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- ASHP Baseline

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	4	0	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- DHW

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

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

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
L00: Circulation	95	-	-
L00: Plant	95	-	-
L00: Commercial Unit 01	95	80	1.875
L00: Commerical Unit 02	95	80	1.875
L00: Store	95	-	-
L00: WC	95	-	-
L00: Circulation	95	-	-
L00: Circulation	95	-	-
L00: Lobby	95	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00: Commercial Unit 01	NO (-15.6%)	NO
L00: Commerical Unit 02	YES (+39.2%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

BASELINE

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	319.7	319.7
External area [m^2]	561.2	566.1
Weather	CAR	CAR
Infiltration [m^3/hm^2@ 50Pa]	10	3
Average conductance [W/K]	213.6	163.49
Average U-value [W/m^2K]	0.38	0.29
Alpha value* [%]	25	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	24.29	11.61
Cooling	2.89	1.52
Auxiliary	0.01	0.01
Lighting	9.29	10.95
Hot water	1.34	0.42
Equipment*	20.93	20.93
TOTAL**	**37.82**	**24.52**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	9.14
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*9.14*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	185.91	117.01
Primary energy [kWh_{PE}/m^2]	58.62	23.39
Total emissions [kg/m^2]	5.62	2.32

BASELINE

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	151.6	41.4	17.2	3.9	0	2.45	2.99	2.5	4
	Notional	88.4	33.8	8.8	2	0	2.78	4.63	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	186.2	0	51.7	0	0	1	0	1	0
	Notional	114.7	0	22.6	0	0	1.41	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

PROPOSED

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

7741_Wells Road_Part-L_Proposed-PV

As built

Date: Wed Aug 20 09:33:01 2025

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.28

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.28

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m^2]: 310.39

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

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	2.39	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.4	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	24.14	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	45.22	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.29	0.3	L000000C:Surf[0]
Floors	0.18	0.25	0.25	L0000005:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	L000000C:Surf[10]
Windows** and roof windows	1.6	1.6	1.6	L000000C:Surf[1]
Rooflights***	2.2	2	2	L000000C:Surf[9]
Personnel doors^	1.6	2.2	2.2	L000000B:Surf[2]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

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

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

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

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

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

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	10

PROPOSED

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Electric Rads

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	4	0	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- DHW

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

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

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
L00: Circulation	95	-	-
L00: Plant	95	-	-
L00: Commercial Unit 01	95	80	1.875
L00: Commerical Unit 02	95	80	1.875
L00: Store	95	-	-
L00: WC	95	-	-
L00: Circulation	95	-	-
L00: Circulation	95	-	-
L00: Lobby	95	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00: Commercial Unit 01	NO (-17.8%)	NO
L00: Commerical Unit 02	YES (+32.3%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

PROPOSED

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	319.7	319.7
External area [m^2]	561.2	566.1
Weather	CAR	CAR
Infiltration [m^3/hm^2@ 50Pa]	10	3
Average conductance [W/K]	213.6	163.49
Average U-value [W/m^2K]	0.38	0.29
Alpha value* [%]	25	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	21.3	11.83
Cooling	2.66	1.53
Auxiliary	0.01	0.01
Lighting	9.29	10.95
Hot water	1.34	0.42
Equipment*	20.93	20.93
TOTAL**	**34.61**	**24.75**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	5.67	8.88
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*5.67*	*8.88*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	190.5	119.04
Primary energy [kWh_{PE}/m^2]	45.22	24.14
Total emissions [kg/m^2]	4.4	2.39

PROPOSED

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	160.1	38.1	13	3.5	0	3.43	2.99	3.5	4
	Notional	90.3	34.1	9	2	0	2.78	4.63	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	189.2	0	52.5	0	0	1	0	1	0
	Notional	116.5	0	22.9	0	0	1.41	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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