

Energy Assessment

The Dower House, 393 High Street



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

Document information

Document prepared for
Mick Edwards

Date of issue
07/11/2025

Issue no.
1

Our reference
11726-The Dower House -Energy Assessment 2021-2511-04rksar.docx

Document prepared by
Rakesh Shivaram

Quality assured by
Agathe Revil

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

Contents:

Document information	1
Executive summary	2
Establishing Carbon Emissions	6
Demand Reduction	8
Cooling and Overheating	12
Heating Infrastructure	14
Renewable Energy	16
Conclusion.....	24
Appendix A	25

Energy Assessment

The Dower House, 393 High Street

Executive summary

About the Scheme

The scheme involves the restoration of the Grade II listed property, which has remained at risk since being gutted by fire in 2011, alongside the construction of 18 new-build homes to the rear of the site to fund the Dower house redevelopment. The site is located in the London Borough of Hillingdon with a total GIA of 2,470m².

Planning policy

The scheme has been developed in accordance with the London Plan 2021 "The Spatial Development Strategy for Greater London, March 2021" and with the Sustainable, Design and Construction SPG. According to the planning policies, the scheme should achieve:

- Zero carbon target
- A minimum on-site CO₂ reduction of at least 35% beyond Building Regulations
- The development should achieve 10% CO₂ improvement through energy efficiency measures 'Be Lean' stage
- Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:
 - through a cash in lieu contribution to the borough's carbon offset fund, or
 - off-site provided that an alternative proposal is identified, and delivery is certain

Summary

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

- New build CO₂ emissions – The actual CO₂ Dwelling Emissions Rate (DER) is no greater than the notional building CO₂ Target Emissions Rate (TER).
- New dwelling Fabric efficiency – The Dwelling Fabric Energy Efficiency (DFEE) is not greater than the Target Fabric Energy Efficiency (TFEE).
- New build Primary energy – The Dwelling Primary Energy Rate (DPER) is no greater than the Target Primary Energy Rate (TPER).
- Refurbishment - Consequential improvements to refurbished areas have been made to ensure that the building complies with Part L, to the extent that such improvements are technically, functionally, and economically feasible.

The CO₂ emissions of the scheme have been calculated using the SAP 10.2 carbon emission factors, and the **refurbishment part of the scheme** (Dower House) can achieve:

- A CO₂ reduction of 81% beyond Building Regulations through energy efficiency measures and inclusion of renewable technologies (Air Source Heat Pumps)
- 1% CO₂ improvement through energy efficiency measures, 'Be Lean' stage
- A further improvement of 79% CO₂ has been achieved through renewable technologies 'Be Green' stage (Air Source Heat Pumps)
- Overall, the refurbishment part of the scheme (Dower House) achieves an improvement of 81% through measures on-site

The CO₂ emissions of **the new build part of the scheme** (18 homes) have also been calculated using the SAP 10.2 carbon emission factors, and it can achieve:

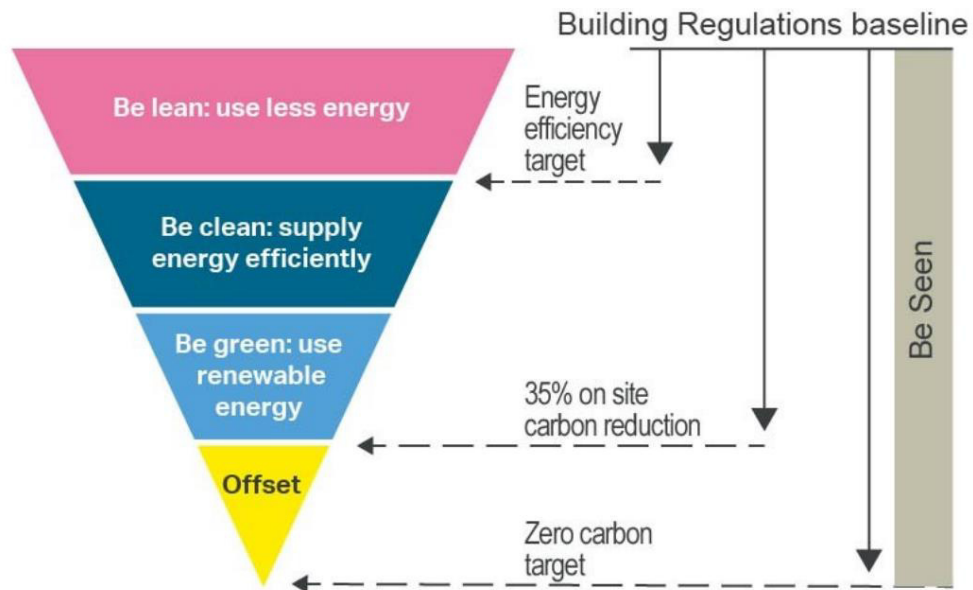
- A CO₂ reduction of 59% beyond Building Regulations through energy efficiency measures and inclusion of renewable technologies (Air Source Heat Pumps)
- 21% CO₂ improvement through energy efficiency measures, 'Be Lean' stage
- A further improvement of 38% CO₂ has been achieved through renewable technologies 'Be Green' stage (Air Source Heat Pumps)
- Overall, the new build part of the scheme (18 homes) achieves an improvement of 60% through measures on-site
- A primary energy reduction of 18%.
- A fabric energy efficiency reduction of 2%

Energy Assessment

The Dower House, 393 High Street

Energy hierarchy

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



Source: Greater London Authority

Key measures

Key measures identified for each stage are shown below:

- **Be Lean:**
 - Low U-values for new opaque elements and fenestration
 - Low air permeability (new build)
 - Low g-value (new build new glazing)
 - High efficiency lighting (whole development)
 - Mechanical ventilation with heat recovery (newbuild)
- **Be Clean:**
 - No measures were specified.
- **Be Green:**
 - Air Source Heat Pumps to provide space heating and hot water (whole development)

Energy Assessment

The Dower House, 393 High Street

GLA's Energy Hierarchy: Regulated carbon emissions - Refurbishment (Dower House)

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

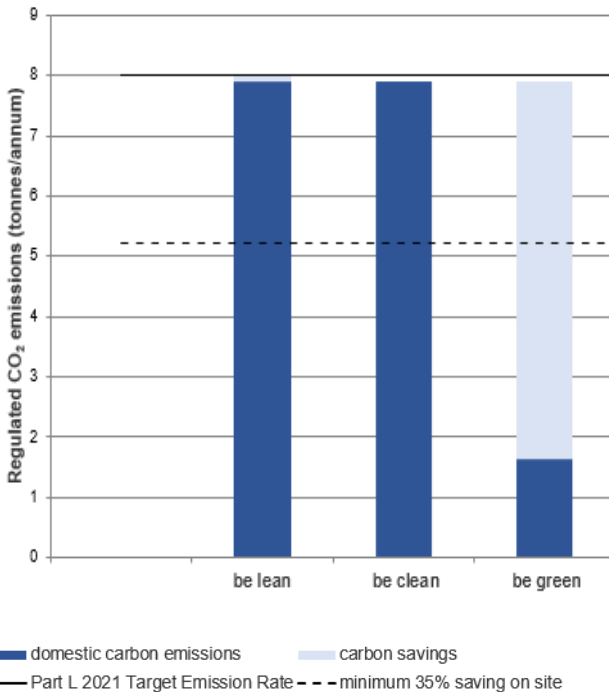
As demonstrated in the figure the refurbishment part of the scheme will reduce carbon emissions by 1% from the fabric energy efficiency measures described in the 'Be Lean' section and will reduce total carbon emissions by 81% over Part L 2021 Building Regulations baseline (Appendix 3 of GLA's Guidance) (using SAP 10.2 carbon dioxide emission factors) with the further inclusion of low and zero carbon technology (Air source heat pumps).

Therefore, the refurbishment part of the scheme meets and exceeds the overall carbon reduction target 'Be Green' stage but fails to meet the carbon reduction target 'Be Lean' stage, therefore failing to comply with London Plan 2021 Policy SI2 and Part L 2021.

This shortfall is primarily due to the unique constraints associated with the heritage nature of the site. The Dower House is a Grade II listed property currently on the Heritage at Risk Register, having been severely damaged by fire in 2011 and remaining structurally unsound and scaffold supported. As such, opportunities for fabric improvements are extremely limited in order to avoid compromising the building's historic fabric and character. The restoration approach has therefore prioritised sensitive repair and conservation-led measures rather than intrusive thermal upgrades. It is acknowledged in the *GLA Energy Assessment Guidance* (June 2022) that the Approved Documents allow for flexibility in meeting the recommended standards where potential restrictions to building upgrades exist, such as in the case of listed buildings or heritage projects. In accordance with GLA guidance, these limitations have been identified and stated above. In addition, the proposal includes the construction of 18 new-build houses to the rear of the heritage property, which will deliver significant energy efficiency improvements that will support and enable the restoration of the listed building.

Regulated CO₂ emissions - Refurbishment (Dower House)

Refurbishment (Dower House)				
GLA's Energy Hierarchy: Regulated CO ₂ - Calculated using SAP 10.2 CO ₂ factors				
	Baseline:	Be lean:	Be clean:	Be green:
CO2 emissions (tCO2/yr)	8.0	7.9	-	1.5
CO2 emissions saving (tCO2/yr)	-	0.10	-	6.4
Saving from each stage (%)	-	1.3	-	79
Total CO2 emissions saving (tCO2/yr)	6.5			
81% total CO2 savings achieved over Part L 2021 Building Regulations baseline (Appendix 3 of GLA's Guidance)				



Energy Assessment

The Dower House, 393 High Street

GLA's Energy Hierarchy: Regulated carbon emissions - New Build (18 homes)

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

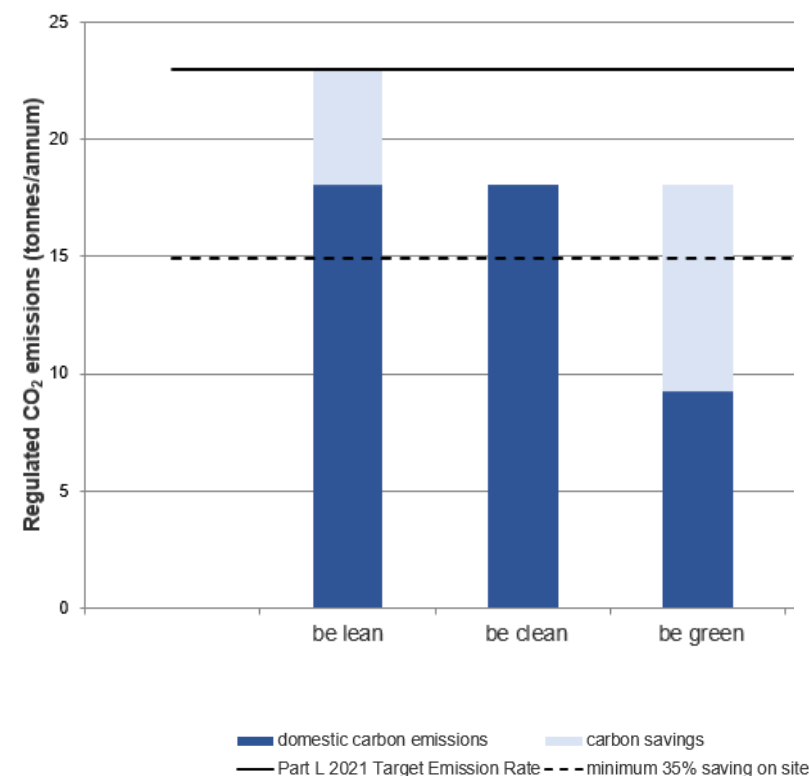
As demonstrated in the figure the new build part of the scheme will reduce carbon emissions by 21% from the fabric energy efficiency measures described in the 'Be Lean' section and will reduce total carbon emissions by 59% over Part L 2021 Building Regulations baseline (using SAP 10.2 carbon dioxide emission factors) with the further inclusion of low and zero carbon technology (Air source heat pumps)

Therefore, the new build part of the scheme meets and exceeds the planning policy carbon reduction target and complies with London Plan 2021 Policy SI2 and Part L 2021.

The carbon offset payment to meet the zero-carbon target has been calculated as £28,826 (carbon price of £95/ tonne of CO2 for 30 years).

Regulated CO₂ emissions - New Build (18 homes)

GLA's Energy Hierarchy: Regulated CO ₂ - Calculated using SAP 10.2 CO ₂ factors				
	Baseline:	Be lean:	Be clean:	Be green:
CO2 emissions (tCO2/yr)	23.00	18.10	-	9.30
CO2 emissions saving (tCO2/yr)	-	4.90	-	8.80
Saving from each stage (%)	-	21.3	-	38.3
Total CO2 emissions saving (tCO2/yr)	13.70			
60% total CO2 savings achieved over Part L 2021 Building Regulations baseline				



Energy Assessment

The Dower House, 393 High Street

Establishing Carbon Emissions

Methodology

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

The methodology followed in this report follows the guidance set out by the Greater London Authority (GLA) for developing energy strategies as detailed in the document. "Energy Assessment Guidance: Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022)". The scheme has been developed in accordance with the London Plan 2021.

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

- Baseline: A calculation of the Part L 2021 Building Regulations compliant CO₂ emission baseline using approved software. The baseline assumes a gas boiler would provide heating and any active cooling would be electrically powered. Photovoltaic panels are included in the baseline in line with Part L 2021. For the refurbishment part of the scheme (Dower House), Appendix 3 of GLA's Guidance has been used.
- Be Lean: A calculation of the impact of demand reduction measures. For example, passive design measures, including optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading, and active design measures such as high efficacy lighting and efficient mechanical ventilation with heat recovery.
- Cooling Hierarchy: In accordance with London Plan 2021 Policy SI4, measures that are proposed to reduce the demand for cooling have been set out such as minimisation of solar and internal gains and night cooling strategies.
- Be Clean: In accordance with London Plan 2021 Policy SI3, this report has demonstrated how the scheme has selected heating, cooling and power systems to minimise carbon emissions. This comprises an evaluation of the feasibility of connecting to existing low carbon heat networks, planned networks, site-wide and communal heat networks, and CHP.
- Be Green: In accordance with London Plan 2021 Policy SI2, this report has conducted a feasibility assessment of renewable energy technologies. This comprised a site-specific analysis of the technologies and, if applicable, how they would be integrated into the heating and cooling strategy for the scheme.

Establishing CO₂ emissions

As required by the GLA both the regulated and unregulated emissions of the development must be quantified and demonstrated. The total emissions for the scheme are shown below.

CO ₂ Emissions - Regulated and Unregulated (tonnes CO ₂ /yr) - SAP 10.2 - Refurbishment (Dower House)			
	Regulated Emissions	Unregulated Emissions	Total Emissions
Baseline: Part L 2021	8.00	1.60	9.60
Be Lean: Use less energy	7.90	1.60	9.50
Be Clean: Supply energy efficiently	-	-	-
Be Green: Use renewable energy	1.50	1.60	3.10
CO ₂ Emissions - Regulated and Unregulated (tonnes CO ₂ /yr) - SAP 10.2 - New Build (18 homes)			
	Regulated Emissions	Unregulated Emissions	Total Emissions
Baseline: Part L 2021	23.00	8.70	31.70
Be Lean: Use less energy	18.10	8.70	26.80
Be Clean: Supply energy efficiently	-	-	-
Be Green: Use renewable energy	9.30	8.70	18.00

Energy Assessment

The Dower House, 393 High Street

Carbon offsetting - New Build(18 Homes)

GLA guidance and Policy P22, requires carbon dioxide reductions to be achieved as far as possible onsite and a cash in lieu contribution will be considered acceptable only in instances where it has been clearly demonstrated that no further savings can be achieved on-site. The remaining savings to reach zero carbon can be achieved either off-site or via a cash in lieu contribution. The annual shortfall is determined by subtracting the overall regulated carbon dioxide savings from the target savings. The result is then multiplied by the assumed lifetime of the development's services (30 years) to give the cumulative shortfall. The cumulative shortfall is multiplied by the carbon dioxide offset price to determine the required cash-in-lieu contribution, as shown below. The cumulative savings for offset payment and the cash-in-lieu contribution have been anticipated and tabulated below, using SAP 10.2 carbon emission factors and an offset price of £95 per tonne.

Regulated carbon dioxide savings from each stage of the energy hierarchy - SAP 10.2		
	(tonnes CO ₂ /yr)	%
Lean Building	3.8	17%
Savings from heat networks	0.00	0%
Proposed Building	9.80	43%
Cumulative on-site savings	13.6	59%
Carbon shortfall (to achieve 35%)	9.4	-
(tonnes CO ₂)		
Cumulative savings for offset	282	
Cash-in-lieu contribution	£26,826	

Energy Assessment

The Dower House, 393 High Street

Demand Reduction

Be Lean: summary

Demand reduction measures have reduced the scheme's carbon emissions by 1% and 17% for the refurbishment (Dower House) and new build (18 homes) parts of the scheme respectively (using SAP 10.2 figures) over the minimum Part L 2021 Building Regulations baseline (Appendix 3 of GLA's Guidance for the refurbishment part of the scheme).

U-values

Refurbishment (Dower House)			
Element	Minimum 2021 Building Regulations U-value W/m ² K	Existing Building U-value W/m ² K Appendix 3 (GLA guidance 2022)	Proposed U-value W/m ² K
Roof (upgraded)	N/A	0.16	0.16 [^]
Wall (existing)	N/A	0.55	0.48 [^]
Repaired/rebuild wall	N/A	0.55	0.48 [^]
Wall (upgraded)	N/A	0.30	0.30 [*]
Wall (new)	0.26	N/A	0.18 ^{**}
Ground floor (Upgraded)	N/A	0.25	0.25 [*]
Windows (existing with secondary glazing)	N/A	1.60 (g-value 0.63)	2.00 (g-value 0.76)
Windows (new)	1.60 (g-value 0.63)	N/A	1.40 (g-value 0.63)
Doors (new)	1.60	N/A	1.40

[^]values from RDSAP based on age of the building and construction type

^{*}Values based on Table 4.3 column (b) of Building regulations Part L v1 Limiting U-values for existing elements in existing dwellings

^{**} Values based on Table 4.2 column of Building regulations Part L v1 Limiting U-values for new fabric elements in existing dwellings

New build (18 homes)		
Element	Minimum 2021 Building Regulations U-value W/m ² K	Proposed U-value W/m ² K
Flat roof (new)	0.16	0.10
Wall (new)	0.26	0.13
Ground floor (new)	0.18	0.10
Windows (new)	1.60	1.20 (g-value 0.45)
Rooflights	2.20	1.20 (g-value 0.45)
Doors (new)	1.60	1.20

Air permeability

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

Air permeability (m ³ /hm ² @50 Pa)	Minimum 2021 Building Regulations	Existing Building Appendix 3 (GLA guidance 2022)	Proposed
Refurbishment (Dower House)	N/A	15	15
New Build (18 homes)	8	N/A	3

This will require careful attention to two key areas:

- Structural leakage
- Services leakage

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

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

Energy Assessment

The Dower House, 393 High Street

Thermal Mass

Thermal mass of the scheme has been calculated as per the table below and based on the construction and size of each dwelling for the new dwellings and indicatively modelled as 250 kJ/m²K (medium) for the refurbished dwellings. The new dwellings have been assumed to have solid walls with blockwork party walls and timber frame internal partitions.

Refurbishment (Dower House)	Thermal mass (kJ/m ² K)
House 1	250
House 2	250
House 3	250
New Build (18 homes)	Thermal mass (kJ/m ² K)
Plot 1	244
Plot 17	424
Plot 18	417
Plot 2	427
Plot 3,16	227
Plot 4, 6, 8, 12, 14	143
Plot 9,10	230

Energy Assessment

The Dower House, 393 High Street

Heating

Refurbishment (Dower House)

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

New build (18 homes)

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

Hot Water

Refurbishment (Dower House)

For the 'Be Lean' scenario, the scheme has been modelled with a gas boiler with an efficiency of 89.5%. For the 'Be Green' final scenario, hot water will be provided by the air source heat pump (Mitsubishi Electric, Ecodan 8.5kW, PUHZ-WM85YAA or similar). A 150L hot water cylinder will be specified for each dwelling with a heat loss factor of 2.08 kWh/day.

New build (18 homes)

For the 'Be Lean', the hot water will be provided by the main gas heating system (gas boiler with an efficiency of 89.5%). For the 'Be Green' final scenario, hot water will be provided by the air source heat pump (Mitsubishi Electric, Ecodan 8.5kW, PUHZ-WM85YAA or similar). A 150L hot water cylinder will be specified with a heat loss factor of 2.08 kWh/day.

Ventilation

Refurbishment (Dower House)

Natural ventilation has been specified for the Dower House as part of the scheme, with two intermittent extract fans provided for Dwelling 2 and one intermittent extract fan each for Dwellings 1 and 3, serving the wet rooms.

New build (18 homes)

Mechanical ventilation with heat recovery (Vent Axia Kinetic Plus E or similar) has been specified for all plots.

- 2 bed flats with 3 wet rooms have been modelled with a SFP of 0.43 and a heat recovery efficiency of 94%.
- 2 bed flats with 3 wet rooms have been modelled with a SFP of 0.53 and a heat recovery efficiency of 94%.
- 4 bed flats with 4 wet rooms have been modelled with a SFP of 0.65 and a heat recovery efficiency of 93%.

Cooling

No cooling has been specified for both refurbishment and new build parts of the scheme.

Lighting

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

House	No. of fittings
Refurbishment (All houses)	35
Newbuild (All Plots)	35

Primary Energy

	Target Primary Energy Rate (MWh/year)	Dwelling Primary Energy Rate (MWh/year)	Improvement (%)
New Build (18 homes)	86.17	104.86	18%

Fabric Energy Efficiency

	Target Fabric Energy Efficiency (MWh/year)	Design Fabric Energy Efficiency (MWh/year)	Improvement (%)
New Build (18 homes)	78.17	76.85	2%

Energy Assessment

The Dower House, 393 High Street

eight
versa

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

Energy Assessment

The Dower House, 393 High Street

Cooling and Overheating

Overheating and cooling

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

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

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

The Cooling Hierarchy in Policy SI4

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

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

Avoiding overheating: measures taken

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

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

Energy Assessment

The Dower House, 393 High Street

2. Minimise internal heat generation through energy efficient design
 - o Internal heat gains have been minimised where possible. Energy efficient appliances will help reduce internal heat gain and reduce the cooling requirement.
 - o Energy efficient lighting will also be specified as per the 'Be Lean' section.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings
 - o High thermal mass - exposed building fabric materials such as masonry or concrete have been utilised in the form of concrete floors and dense masonry external walls. These materials act as 'thermal batteries'; they absorb heat gains during the day when the building is occupied and 'store' it for an extended period, thereby helping to stabilise daytime temperatures. At night this heat can be dissipated, which 'resets' the heating cycle. Ventilation will also be used at night to purge the stored heat within the structure. A 'ground coupled' system that uses the thermal storage capacity of the ground has not been specified as the passive ventilation option has been selected instead.
 - o Room heights - high ceilings are traditionally used in hot climates to allow thermal stratification so that occupants can inhabit the lower cooler space, and to decrease the transfer of heat gain through the roof. The proposed building has floor to ceiling heights of more than 2.5m. As the roof will be well insulated to below building regulations, there will be minimal penetration of heat through the roof.
4. Provide passive ventilation
 - o Openable windows are specified on all facades of the building.
 - o Dual aspect units have been specified where possible, to allow for cross ventilation. Cross ventilation will be achieved by opening windows on two facades and ensuring there is a clear path for airflow.
 - o Night time cooling will also be utilised. This will work in tandem with high thermal mass materials specified. The larger temperature differential that exists between internal and external temperatures at night will allow effective purging of heat accumulated within the structure during the day.
5. Provide mechanical ventilation
 - o Mechanical ventilation with summer by-pass will be used to make use of 'free cooling' where the outside air temperature is below that in the building during summer months.
 - o A mixed mode system will be implemented. This will be complimentary to the passive cooling measures taken. During summer months, mechanical ventilation using fans will remove hot air from the building.
 - o The mechanical systems will comply with the Domestic Building Services Compliance Guide as it is demonstrated in the 'Be Lean' section.

Energy Assessment

The Dower House, 393 High Street

Heating Infrastructure

Heating infrastructure including CHP

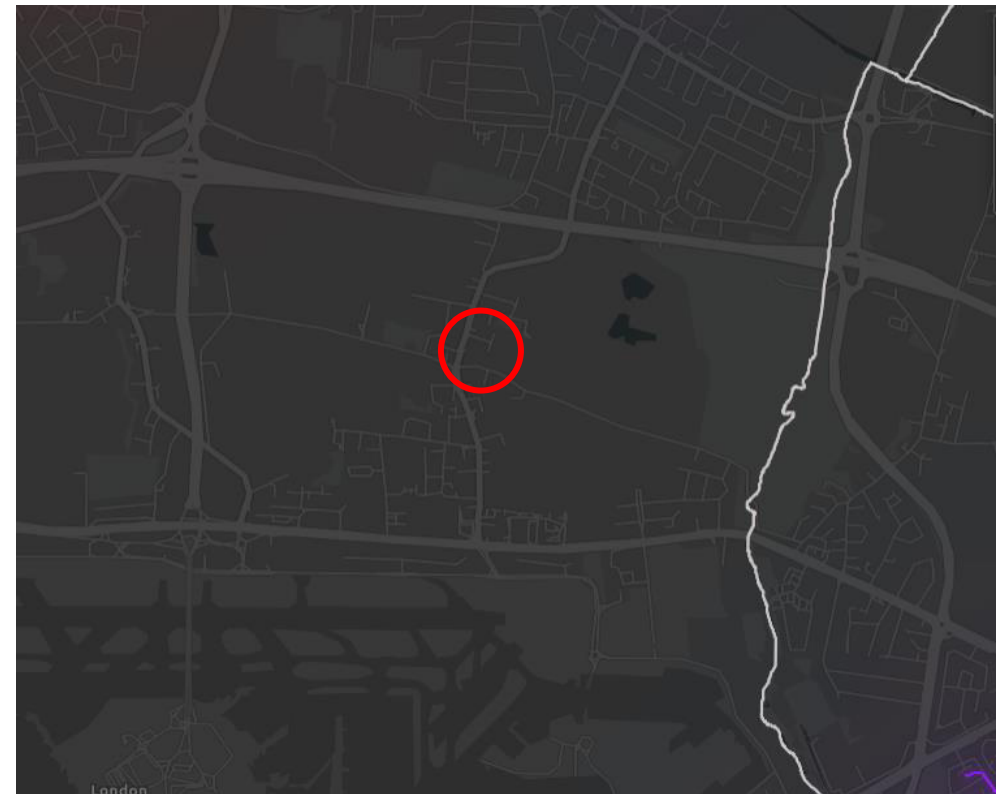
Once demand for energy has been minimised, schemes must demonstrate how their energy systems have been selected in accordance with the order of preference in Policy SI3 of London Plan 2021. This has involved a systematic appraisal of the potential to connect to existing or planned heating networks and on site communal and CHP systems.

To comply with London Plan 2021 Policy SI 3, developments in Heat Network Priority Areas (HNPAs) should have a communal low-temperature heating system and should select a heat source in accordance with the following heating hierarchy:

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

Connect to local existing or planned heat network

The illustration below shows the London heat map. Red lines are existing heat networks and purple lines are proposed heat networks. The red circle shows the location of the proposed scheme.



A review of the London Heat Map demonstrates that there are no existing networks present within connectable range of the scheme. Therefore, a connection is not possible.

Energy Assessment

The Dower House, 393 High Street

Use zero-emission and/or local secondary heat sources

According to the GLA and London Plan 2021 Policy SI3, the exploitation of local energy opportunities to maximise the use of locally available energy sources whilst minimising primary energy demand and carbon emissions is encouraged. Secondary heat includes environmental sources such as air, water and ground; and waste sources such as heat from the sewerage system, sewage treatment plants, the tube network, data centres and chiller systems.

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

Use low-emission combined heat and power (CHP)

In accordance with section 9 of the GLA guidance for Energy Planning where connection to an area wide heat network will not be available in the foreseeable future i.e. 5 years following completion, or the development is of such a scale that it could be the catalyst for an area wide heat network, applicants should evaluate the feasibility of on-site CHP.

GLA guidance stipulates that small, or purely residential developments of less than 350 dwellings will not be expected to include on-site CHP. CHP systems are best utilised where there is a consistent and high demand for heat. Because of the small electricity supplies and demand of this scheme, a CHP installed to meet the base heat load would typically require the export of electricity to the grid. The administrative burden of managing CHP electricity sales at a small scale without an active energy service companies (ESCOs) is prohibitive for smaller operators of residential developments.

The heat demand profile of this residential scheme is not suitable to CHP. The implemented fabric improvements from the 'Be Lean' scenario have also reduced the energy demand from space heating to hot water. For CHP systems to be economically viable they need to run for at least 5,000 hours per year. Therefore, a CHP system would most likely be oversized, and as a result less efficient and economic.

Use ultra-low NOx gas boilers

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

Energy Assessment

The Dower House, 393 High Street

Renewable Energy

Renewable Energy Feasibility:

In line with Policy SI2 of the London Plan 2021 the feasibility of renewable energy technologies has been considered. A detailed site-specific analysis and associated carbon saving calculations has also been provided for renewable energy technologies considered feasible.

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

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

- Local, site-specific impact: (Maximum score of 5)
 - Local planning criteria = ✓
 - Land used by all components = ✓
 - Noise impact from operation = ✓
 - Interaction on the current building design = ✓
 - Buildability of installation = ✓
- Economic viability: (Maximum score of 5)
 - Capital cost of all components = ✓
 - Grants and funding available = ✓
 - Payback periods (years) 3-5, 5-10, 10-15 = ✓
 - Servicing requirements (low or high) = ✓
 - Maintenance costs (low or high) = ✓

- CO₂ and sustainability: (Maximum score of 10)
 - Carbon saving per year = ✓✓✓✓
 - Impact of future grid decarbonisation (gas vs. electric) = ✓✓
 - Local air quality/pollution = ✓✓
 - Resource use of installation = ✓✓

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

Energy Assessment

The Dower House, 393 High Street

Biomass & Biofuel - Rejected

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

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

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

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

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

It is estimated that the heating and hot water demand of the site is too large to meet the required CO₂ emissions reduction if a biomass boiler was a standalone system. Therefore, a biomass boiler would need to be combined with energy demand reduction measures and/or CHP. The site is likely to be unsuitable for biomass boilers due to site constraints such as limited transport/access issues, and storage of the biomass fuel. Since the development comprises refurbishment of an existing built up site, it is not considered feasible to explore this option further.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
✓ Local air quality impacts, increased transport usage, increased plant space, slightly increased buildability issues.	✓✓✓ Increased capital costs of installation, typical payback of 8 years, Increased maintenance relative to gas boiler, resource use not significantly increased if well serviced.	✓✓✓✓✓ Very low carbon intensity of feedstock if properly procured. Decarbonisation impact not applicable, air quality issues.

Energy Assessment

The Dower House, 393 High Street

Photovoltaic Panels (PV) - Accepted

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

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

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

The most suitable location for mounting photovoltaic panels is on roofs as they usually have the greatest exposure to the sun. The proposed new build site has a potential useable roof area of approximately 30 - 75 m² (varies across all the 18 plots) facing north and south predominately. Dower house part of the scheme is grade II listed building hence has heritage and structural. The use of solar PVs is not considered appropriate for this scheme. The scheme has a space heating and domestic hot water demand which will be met solely by an air source heat pump system

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
✓✓✓✓ No local air quality impacts, use of unutilised roof space, no noise issues, good orientation, and slightly increased buildability issues for wiring and metering.	✓✓ Increased capital costs of installation, typical payback of 10-15 years, Feed in Tariff available, limited servicing and maintenance i.e. 1 visit per year, inverter will require replacement.	✓✓✓✓✓✓ ✓✓✓ High carbon saving from electricity, uses minimal grid electricity, no local air impact, high embodied energy of panels.

Energy Assessment

The Dower House, 393 High Street

Solar Thermal - Rejected

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

Like photovoltaic panels the most suitable location for mounting solar hot water panels is on roofs as they usually have the greatest exposure to the sun. The proposed site has a potential useable roof area for solar thermal, however, the scheme has used this area for air source heat pumps and solar PV.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
✓✓✓✓ No local air quality impacts, use of unutilised roof space, no noise issues, good orientation, slightly increased buildability issues for piping and cylinders.	✓✓✓ Increased capital costs of installation, typical payback of 8-10 years, Heat Incentive available, limited servicing and maintenance i.e. 1 visit per year, heat transfer fluid requires replacing every 10 years.	✓✓✓✓✓ ✓ Lower carbon saving as primarily displacing gas, uses minimal grid electricity, no local air impact, medium embodied energy of panels.

Energy Assessment

The Dower House, 393 High Street

Wind Energy - Rejected

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

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

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

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

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

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

Energy Assessment

The Dower House, 393 High Street

Ground Source Heat Pump (GSHP) - Rejected

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

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

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

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

The installation cost for a Ground Source Heat pump is typically high compared to a gas-boiler installation but the efficiency GSHP is high and CO2 emissions are comparatively less compared to gas boiler.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
✓✓ No local air quality impacts, no visual impact, no noise issues, however the constrained site may prohibit its installation. Increased buildability issues for pipework and heating emitters internally.	✓ High capital costs of installation, typical payback >15 years where gas is displaced, Renewable Heat Incentive available, limited servicing and maintenance i.e. 1 visit per year, mechanical parts may require replacement over lifespan.	✓✓✓✓✓ Medium carbon saving from gas displacement, consumes some electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.

Energy Assessment

The Dower House, 393 High Street

Air Source Heat Pump (ASHP) - Accepted

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

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

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

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

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
✓✓✓✓ No local air quality impacts, use of unutilised roof space, over visual impact, low noise issues, increased buildability issues for pipework and heating emitters internally.	✓✓ Medium- high capital costs of installation, typical payback >15 years where gas is displaced, Renewable Heat Incentive available Limited servicing and maintenance i.e. 1 visit per year, mechanical parts may require replacement over lifespan.	✓✓✓✓✓✓ ✓✓ Medium carbon saving from gas displacement, less efficient in winter, consumes electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.

Energy Assessment

The Dower House, 393 High Street

Summary comparison matrix

An assessment of the feasibility of each of the technologies is shown below.

Renewable Technology	Comments	Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)	Total Score
Biomass Boiler	High air quality impact	✓	✓✓✓	✓✓✓✓✓	9
Photovoltaic	High CO ₂ savings and low visual impact	✓✓✓✓	✓✓	✓✓✓✓✓ ✓✓✓	14
Solar Thermal	Low CO ₂ savings compared to PV panels	✓✓✓✓	✓✓✓	✓✓✓✓✓ ✓	13
Wind Energy	High visual and noise impact	✓	✓✓✓✓	✓✓✓✓✓	10
GSHP	High capital cost	✓✓	✓	✓✓✓✓✓ ✓✓✓	11
ASHP	Low capital cost but low CO ₂ savings compared to GSHP	✓✓✓✓	✓✓	✓✓✓✓✓✓ ✓	13

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

Due to the limited roof space, heritage risk and orientations of the site, ASHPs have been specified as they can provide higher CO₂ savings compared to the solar thermal panels.

Air Source Heat Pump (ASHP) - Performance

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

Energy Assessment

The Dower House, 393 High Street

Conclusion

Summary

The scheme involves the restoration of the Grade II listed property, which has remained at risk since being gutted by fire in 2011, alongside the construction of 18 new-build homes to the rear of the site to fund the Dower house redevelopment. The site is located in the London Borough of Hillingdon with a total GIA of 2,470m².

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

- A primary energy reduction of 18%.
- A fabric energy efficiency reduction of 2%

- New build CO₂ emissions – The actual CO₂ Dwelling Emissions Rate (DER) is no greater than the notional building CO₂ Target Emissions Rate (TER).
- New dwelling Fabric efficiency – The Dwelling Fabric Energy Efficiency (DFEE) is not greater than the Target Fabric Energy Efficiency (TFEE).
- New build Primary energy – The Dwelling Primary Energy Rate (DPER) is no greater than the Target Primary Energy Rate (TPER).
- Refurbishment - Consequential improvements to refurbished areas have been made to ensure that the building complies with Part L, to the extent that such improvements are technically, functionally, and economically feasible.

The CO₂ emissions of the scheme have been calculated using the SAP 10.2 carbon emission factors, and the **refurbishment part of the scheme** (Dower House) can achieve:

- A CO₂ reduction of 81% beyond Building Regulations through energy efficiency measures and inclusion of renewable technologies (Air Source Heat Pumps)
- 1% CO₂ improvement through energy efficiency measures, 'Be Lean' stage
- A further improvement of 79% CO₂ has been achieved through renewable technologies 'Be Green' stage (Air Source Heat Pumps)
- Overall, the refurbishment part of the scheme (Dower House) achieves an improvement of 81% through measures on-site

The CO₂ emissions of **the new build part of the scheme** (18 homes) have also been calculated using the SAP 10.2 carbon emission factors, and it can achieve:

- A CO₂ reduction of 59% beyond Building Regulations through energy efficiency measures and inclusion of renewable technologies (Air Source Heat Pumps)
- 21% CO₂ improvement through energy efficiency measures, 'Be Lean' stage
- A further improvement of 38% CO₂ has been achieved through renewable technologies 'Be Green' stage (Air Source Heat Pumps)
- Overall, the new build part of the scheme (18 homes) achieves an improvement of 60% through measures on-site

Energy Assessment

The Dower House, 393 High Street

Appendix A

[SAP files](#)

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

Refurbishment

- Summary of DER, TER, DPER, TPER
- Baseline - DER from the baseline scenario TER SAP worksheet
- Be Lean- DER from the Be Lean scenario DER SAP worksheet
- Be Green - DER from the Be Green scenario DER SAP worksheet

New build

- Summary of DER, TER, DFEE, TFEE, DPER, TPER
- Be Lean - DER from the Be Lean scenario DER SAP worksheet
- Baseline- TER from the Be Green scenario TER SAP worksheet
- Be Green- DER from the Be Green scenario DER SAP worksheet

Energy Assessment

The Dower House, 393 High Street



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

Summary of DER, TER, DPER, TPER - Refurbishment

House	Multiplier	Area (m ²)	Baseline TER (kgCO ₂ /m ²)	Lean DER (kgCO ₂ /m ²)	Green DER (kgCO ₂ /m ²)	TPER (kWh/m ²)	DPER (kWh/m ²)
House 1	1	108.52	23.29	22.39	4.45	50.08	46.28
House 2	1	115.42	24.13	23.80	4.54	50.26	47.07
House 3	1	82.54	32.69	33.06	6.46	76.52	67

Energy Assessment

The Dower House, 393 High Street

eight
versa

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

Baseline - DER from the baseline scenario TER SAP worksheet

Full SAP Calculation Printout



Property Reference	Baseline HOUSE 1				Issued on Date	07/11/2025
Assessment Reference	Lean House 1		Prop Type Ref			
Property						
SAP Rating	79 C	DER	23.29	TER	9.74	
Environmental	78 C	% DER < TER				-139.12
CO ₂ Emissions (t/year)	2.19	DFEE	80.08	TFEE	33.41	
Compliance Check	See BREL	% DFEE < TFEE				-139.70
% DPER < TPER	-150.46	DPER	127.41	TPER	50.87	
Assessor Details	Ms. Vanessa Vienna				Assessor ID	T798-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	54.2600 (1b)	x 2.3000 (2b)	= 124.7980 (1b) - (3b)
First floor	54.2600 (1c)	x 2.3000 (2c)	= 124.7980 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.5960 (5)

2. Ventilation rate

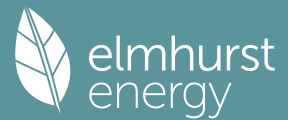
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (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) = 0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491 (22b)
Effective ac	0.8303	0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows upgraded			11.3200	1.5038	17.0226		(27)
Doors new			4.4100	1.6000	7.0560		(26)
Upgraded floor			54.9600	0.2500	13.7400		(28a)
Upgraded wall	12.1400	1.4500	10.6900	0.3000	3.2070		(29a)
New wall	25.0000	2.3900	22.6100	0.3000	6.7830		(29a)
Match existing	13.1500	1.4500	11.7000	0.5500	6.4350		(29a)
EXISTING WALL	40.9000	10.4400	30.4600	0.5500	16.7530		(29a)
Upgraded roof	54.9600		54.9600	0.1600	8.7936		(30)
Total net area of external elements Aum(A, m ²)			201.1100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.7902		(33)
Main dwelling							
Party Wall 1			62.0200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							40.2220 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	120.0122 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							

Full SAP Calculation Printout



(38)m	Jan 68.3917	Feb 67.3352	Mar 66.2995	Apr 61.4353	May 60.5252	Jun 56.2886	Jul 56.2886	Aug 55.5041	Sep 57.9205	Oct 60.5252	Nov 62.3663	Dec 64.2911	(38)
Heat transfer coeff	188.4039	187.3473	186.3117	181.4475	180.5374	176.3008	176.3008	175.5162	177.9327	180.5374	182.3785	184.3032	(39)
Average = Sum(39)m / 12 =												181.4431	
HLP	Jan 1.7361	Feb 1.7264	Mar 1.7168	Apr 1.6720	May 1.6636	Jun 1.6246	Jul 1.6246	Aug 1.6174	Sep 1.6396	Oct 1.6636	Nov 1.6806	Dec 1.6983	(40)
HLP (average)												1.6720	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8056 (42)
Hot water usage for mixer showers													
71.2612	70.1903	68.6298	65.6440	63.4405	60.9833	59.5865	61.1353	62.8330	65.4713	68.5213	70.9882	(42a)	
Hot water usage for baths													
32.3872	31.9063	31.2289	29.9800	29.0448	28.0079	27.4478	28.1204	28.8527	29.9623	31.2369	32.2778	(42b)	
Hot water usage for other uses													
45.6448	43.9850	42.3252	40.6654	39.0056	37.3458	37.3458	39.0056	40.6654	42.3252	43.9850	45.6448	(42c)	
Average daily hot water use (litres/day)												137.2239 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
149.2933	146.0816	142.1839	136.2894	131.4910	126.3369	124.3801	128.2613	132.3511	137.7589	143.7432	148.9108	(44)	
Energy content (annual)	236.4441	208.0183	218.5314	186.5734	177.0121	155.3460	150.4270	158.8142	163.2022	186.9375	204.7886	233.1583 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =	2279.2531		
35.4666	31.2027	32.7797	27.9860	26.5518	23.3019	22.5640	23.8221	24.4803	28.0406	30.7183	34.9738	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month	287.4030	254.0457	269.4903	235.8884	227.9710	204.6611	201.3859	209.7731	212.5172	237.8964	254.1037	284.1172 (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	287.4030	254.0457	269.4903	235.8884	227.9710	204.6611	201.3859	209.7731	212.5172	237.8964	254.1037	284.1172 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	2879.2531	(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	91.3574	80.6729	85.4014	74.3644	71.5963	63.9813	62.7567	65.5455	66.5935	74.8964	80.4210	90.2649 (65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 140.2822	Feb 140.2822	Mar 140.2822	Apr 140.2822	May 140.2822	Jun 140.2822	Jul 140.2822	Aug 140.2822	Sep 140.2822	Oct 140.2822	Nov 140.2822	Dec 140.2822	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	151.5763	167.8166	151.5763	156.6288	151.5763	156.6288	151.5763	151.5763	156.6288	151.5763	156.6288	151.5763	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	269.4123	272.2079	265.1629	250.1651	231.2329	213.4394	201.5522	198.7565	205.8015	220.7994	239.7315	257.5251	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	(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)	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	(71)
Water heating gains (Table 5)	122.7922	120.0490	114.7868	103.2839	96.2315	88.8629	84.3504	88.0987	92.4910	100.6673	111.6958	121.3238	(72)
Total internal gains	611.8654	628.1582	599.6108	578.1625	547.1254	524.0158	502.5635	503.5162	520.0060	541.1276	576.1408	598.5098	(73)

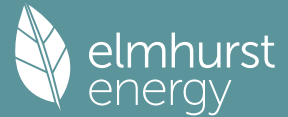
6. Solar gains

[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					
North		2.9000	10.6334	0.6300	0.7000	0.7700	9.4241 (74)					
East		2.3900	19.6403	0.6300	0.7000	0.7700	14.3455 (76)					
West		6.0300	19.6403	0.6300	0.7000	0.7700	36.1940 (80)					
Solar gains	59.9637	116.8761	193.4217	286.6177	357.2360	368.7971	349.8046	296.1344	226.1596	138.7515	74.6427	49.4177 (83)
Total gains	671.8291	745.0342	793.0325	864.7802	904.3614	892.8129	852.3681	799.6506	746.1656	679.8791	650.7836	647.9275 (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	39.9998	40.2253	40.4489	41.5333	41.7427	42.7458	42.7458	42.9368	42.3537	41.7427	41.3213	40.8897		
alpha	3.6667	3.6817	3.6966	3.7689	3.7828	3.8497	3.8497	3.8625	3.8236	3.7828	3.7548	3.7260		
util living area	0.9973	0.9956	0.9924	0.9817	0.9532	0.8751	0.7548	0.7981	0.9358	0.9862	0.9955	0.9977	(86)	
MIT	19.2583	19.3913	19.6309	20.0072	20.3650	20.6832	20.8296	20.8046	20.5591	20.1007	19.6429	19.2670	(87)	
Th 2	19.5151	19.5220	19.5288	19.5610	19.5670	19.5953	19.5953	19.6006	19.5844	19.5670	19.5548	19.5420	(88)	
util rest of house														

Full SAP Calculation Printout



MIT 2	0.9962	0.9940	0.9892	0.9728	0.9255	0.7883	0.5782	0.6374	0.8838	0.9779	0.9935	0.9968 (89)
Living area fraction	17.5198	17.6948	18.0060	18.5070	18.9553	19.3378	19.4616	19.4525	19.2047	18.6330	18.0407	17.5501 (90)
MIT	17.9873	18.1510	18.4429	18.9104	19.3344	19.6995	19.8295	19.8161	fLA = Living area / (4) =			0.2689 (91)
Temperature adjustment									19.5689	19.0276	18.4715	18.0118 (92)
adjusted MIT	17.8373	18.0010	18.2929	18.7604	19.1844	19.5495	19.6795	19.6661	19.4189	18.8776	18.3215	17.8618 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9913	0.9851	0.9656	0.9152	0.7846	0.5911	0.6469	0.8751	0.9716	0.9907	0.9953	(94)
Useful gains	668.1050	738.5715	781.2165	835.0025	827.6351	700.5190	503.8094	517.2837	652.9324	660.5975	644.7472	644.8619	(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	2550.4724	2454.4354	2197.1639	1789.1375	1351.2073	872.6086	542.9150	573.2474	946.4073	1494.4242	2046.5673	2517.9075	(97)
Space heating kWh	1400.4814	1153.0606	1053.4648	686.9772	389.5378	0.0000	0.0000	0.0000	0.0000	620.3670	1009.3105	1393.5460	(98a)
Space heating requirement - total per year (kWh/year)												7706.7452	
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	1400.4814	1153.0606	1053.4648	686.9772	389.5378	0.0000	0.0000	0.0000	0.0000	620.3670	1009.3105	1393.5460	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7706.7452	
Space heating per m2											(98c) / (4) =	71.0168	(99)

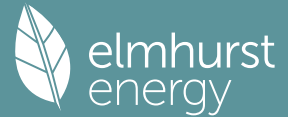
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1400.4814	1153.0606	1053.4648	686.9772	389.5378	0.0000	0.0000	0.0000	0.0000	620.3670	1009.3105	1393.5460 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	1564.7836	1288.3358	1177.0557	767.5723	435.2377	0.0000	0.0000	0.0000	0.0000	693.1475	1127.7212	1557.0346 (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	287.4030	254.0457	269.4903	235.8884	227.9710	204.6611	201.3859	209.7731	212.5172	237.8964	254.1037	284.1172 (64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	321.1207	283.8499	301.1065	263.5625	254.7162	228.6716	225.0122	234.3834	237.4494	265.8060	283.9147	317.4494 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	32.2241	25.8514	23.2763	17.0532	13.1724	10.7620	12.0163	15.6192	20.2879	26.6188	30.0658	33.1197 (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												8610.8885 (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												3217.0425 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												260.0672 (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												12128.9982 (238)

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

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

Full SAP Calculation Printout



Space heating - main system 1	8610.8885	0.2100	1808.2866 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3217.0425	0.2100	675.5789 (264)
Space and water heating			2483.8655 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	260.0672	0.1443	37.5357 (268)
Total CO2, kg/year			2527.0885 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			23.2900 (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	8610.8885	1.1300	9730.3040 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3217.0425	1.1300	3635.2581 (278)
Space and water heating			13365.5621 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	260.0672	1.5338	398.8997 (282)
Total Primary energy kWh/year			13826.4866 (286)
Dwelling Primary energy Rate (DPER)			127.4100 (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	54.2600 (1b)	x 2.3000 (2b)	= 124.7980 (1b) - (3b)
Ground floor	54.2600 (1c)	x 2.3000 (2c)	= 124.7980 (1c) - (3c)
First floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.5200		(5)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.5960 (5)

2. Ventilation rate

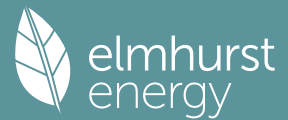
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1603 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4103 (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) = 0.3487 (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	0.4446	0.4359	0.4272	0.3836	0.3749	0.3313	0.3313	0.3226	0.3487	0.3749	0.3923	0.4097 (22b)
Effective ac	0.5988	0.5950	0.5912	0.5736	0.5703	0.5549	0.5549	0.5520	0.5608	0.5703	0.5770	0.5839 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			4.4100	1.0000	4.4100		(26)
TER Opening Type			11.3200	1.1450	12.9618		(27)
Upgraded floor			54.9600	0.1300	7.1448		(28a)
Upgraded wall	12.1400	1.4500	10.6900	0.1800	1.9242		(29a)
New wall	25.0000	2.3900	22.6100	0.1800	4.0698		(29a)
match existing	13.1500	1.4500	11.7000	0.1800	2.1060		(29a)
EXISTING WALL	40.9000	10.4400	30.4600	0.1800	5.4828		(29a)
Upgraded roof	54.9600		54.9600	0.1100	6.0456		(30)
Total net area of external elements Aum(A, m2)			201.1100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.1450		(33)
Main dwelling							
Party Wall 1			62.0200	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)							10.0555 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	54.2005 (37)

Full SAP Calculation Printout



Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 49.3247	Feb 49.0085	Mar 48.6987	Apr 47.2432	May 46.9709	Jun 45.7032	Jul 45.7032	Aug 45.4684	Sep 46.1915	Oct 46.9709	Nov 47.5218	Dec 48.0977 (38)
Heat transfer coeff	103.5252	103.2091	102.8992	101.4437	101.1714	99.9037	99.9037	99.6690	100.3920	101.1714	101.7223	102.2982 (39)
Average = Sum(39)m / 12 =												101.4424
HLP	Jan 0.9540	Feb 0.9511	Mar 0.9482	Apr 0.9348	May 0.9323	Jun 0.9206	Jul 0.9206	Aug 0.9184	Sep 0.9251	Oct 0.9323	Nov 0.9374	Dec 0.9427 (40)
HLP (average)												0.9348
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

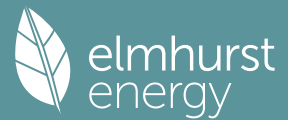
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.8056 (42)
Hot water usage for mixer showers												
	71.2612	70.1903	68.6298	65.6440	63.4405	60.9833	59.5865	61.1353	62.8330	65.4713	68.5213	70.9882 (42a)
Hot water usage for baths												
	30.7679	30.3109	29.6675	28.4810	27.5926	26.6075	26.0754	26.7144	27.4101	28.4642	29.6751	30.6639 (42b)
Hot water usage for other uses												
	43.3626	41.7858	40.2090	38.6321	37.0553	35.4785	35.4785	37.0553	38.6321	40.2090	41.7858	43.3626 (42c)
Average daily hot water use (litres/day)												133.6477 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	145.3917	142.2870	138.5062	132.7571	128.0884	123.0693	121.1404	124.9050	128.8752	134.1445	139.9821	145.0147 (44)
Energy conte	230.2650	202.6148	212.8789	181.7379	172.4317	151.3280	146.5089	154.6584	158.9160	182.0328	199.4302	227.0579 (45)
Energy content (annual)										Total = Sum(45)m =		2219.8605
Distribution loss (46)m = 0.15 x (45)m												
	34.5397	30.3922	31.9318	27.2607	25.8648	22.6992	21.9763	23.1988	23.8374	27.3049	29.9145	34.0587 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	281.2239	248.6422	263.8378	231.0529	223.3906	200.6431	197.4678	205.6173	208.2311	232.9917	248.7453	278.0168 (62)
WWHRS	-32.5777	-28.8120	-30.1702	-24.9821	-23.2824	-19.9230	-18.6746	-19.8586	-20.6131	-24.3005	-27.5295	-31.9744 (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												
	248.6462	219.8303	233.6676	206.0708	200.1081	180.7201	178.7932	185.7588	187.6180	208.6912	221.2157	246.0425 (64)
12Total per year (kWh/year)												2517.1625 (64)
Electric shower(s)												2517 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	89.3028	78.8763	83.5220	72.7566	70.0733	62.6453	61.4539	64.1637	65.1683	73.2656	78.6393	88.2365 (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	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	155.5137	172.1759	155.5137	160.6975	155.5137	160.6975	155.5137	155.5137	160.6975	155.5137	160.6975	155.5137 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	269.4123	272.2079	265.1629	250.1651	231.2329	213.4394	201.5522	198.7565	205.8015	220.7994	239.7315	257.5251 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258 (71)
Water heating gains (Table 5)												
	120.0307	117.3754	112.2607	101.0508	94.1845	87.0074	82.5994	86.2415	90.5116	98.4753	109.2213	118.5974 (72)
Total internal gains												
	613.0413	629.8439	601.0220	579.9980	549.0157	526.2289	504.7499	505.5963	522.0952	542.8730	577.7349	599.7208 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	FF											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	2.9000				10.6334		0.6300		0.7000		0.7700	9.4241 (74)
East	2.3900				19.6403		0.6300		0.7000		0.7700	14.3455 (76)
West	6.0300				19.6403		0.6300		0.7000		0.7700	36.1940 (80)
Solar gains	59.9637	116.8761	193.4217	286.6177	357.2360	368.7971	349.8046	296.1344	226.1596	138.7515	74.6427	49.4177 (83)
Total gains	673.0049	746.7199	794.4437	866.6157	906.2517	895.0260	854.5544	801.7308	748.2548	681.6245	652.3777	649.1385 (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	72.7949	73.0179	73.2378	74.2886	74.4886	75.4337	75.4337	75.6114	75.0668	74.4886	74.0852	73.6681
alpha	5.8530	5.8679	5.8825	5.9526	5.9659	6.0289	6.0289	6.0408	6.0045	5.9659	5.9390	5.9112
util living area												
	0.9976	0.9949	0.9884	0.9594	0.8720	0.6847	0.5098	0.5633	0.8222	0.9722	0.9945	0.9980 (86)
MIT	19.9167	20.0584	20.2751	20.5928	20.8450	20.9726	20.9960	20.9929	20.9202	20.5994	20.2137	19.9008 (87)
Th 2	20.1219	20.1243	20.1267	20.1380	20.1401	20.1500	20.1500	20.1519	20.1462	20.1401	20.1359	20.1314 (88)

Full SAP Calculation Printout



util rest of house	0.9968	0.9933	0.9844	0.9449	0.8298	0.6059	0.4138	0.4639	0.7545	0.9595	0.9924	0.9974 (89)
MIT 2	18.8506	19.0333	19.3106	19.7144	20.0056	20.1339	20.1487	20.1492	20.0901	19.7295	19.2410	18.8374 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.1373	19.3089	19.5700	19.9506	20.2313	20.3594	20.3765	20.3761	20.3133	19.9634	19.5026	19.1233 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1373	19.3089	19.5700	19.9506	20.2313	20.3594	20.3765	20.3761	20.3133	19.9634	19.5026	19.1233 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9912	0.9810	0.9411	0.8347	0.6261	0.4397	0.4907	0.7691	0.9562	0.9903	0.9963	(94)
Useful gains	669.9741	740.1355	779.3443	815.6002	756.4931	560.3958	375.7561	393.4314	575.4641	651.7808	646.0427	646.7528	(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	1536.0301	1487.1287	1344.8914	1121.0112	863.1261	575.3892	377.2851	396.2917	623.7683	947.3058	1261.6203	1526.6307	(97)
Space heating kWh	644.3456	501.9794	420.7671	219.8959	79.3350	0.0000	0.0000	0.0000	0.0000	219.8707	443.2159	654.6292	(98a)
Space heating requirement - total per year (kWh/year)												3184.0387	
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	644.3456	501.9794	420.7671	219.8959	79.3350	0.0000	0.0000	0.0000	0.0000	219.8707	443.2159	654.6292	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3184.0387	
Space heating per m2										(98c) / (4) =			29.3406 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	644.3456	501.9794	420.7671	219.8959	79.3350	0.0000	0.0000	0.0000	0.0000	219.8707	443.2159	654.6292 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	697.3438	543.2678	455.3756	237.9826	85.8604	0.0000	0.0000	0.0000	0.0000	237.9553	479.6708	708.4731 (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	248.6462	219.8303	233.6676	206.0708	200.1081	180.7201	178.7932	185.7588	187.6180	208.6912	221.2157	246.0425 (64)
Efficiency of water heater												80.3000 (216)
(217)m	86.3257	86.0919	85.6257	84.5209	82.5677	80.3000	80.3000	80.3000	80.3000	84.4935	85.8392	86.3730 (217)
Fuel for water heating, kWh/month	288.0326	255.3437	272.8942	243.8106	242.3565	225.0562	222.6565	231.3310	233.6464	246.9909	257.7094	284.8604 (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	32.3127	25.9224	23.3403	17.1001	13.2086	10.7915	12.0493	15.6622	20.3436	26.6919	30.1484	33.2107 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-49.3329	-68.8030	-97.8035	-108.6559	-116.0079	-107.8072	-106.4437	-101.0601	-91.3758	-78.0607	-53.9610	-42.7368 (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	-30.1144	-63.1055	-125.0093	-187.1712	-246.9560	-247.9936	-245.1007	-207.7759	-152.6089	-90.0734	-40.1451	-23.8337 (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												3445.9293 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3004.6884 (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)												260.7818 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2681.9364 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4115.4632 (238)

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

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

Full SAP Calculation Printout

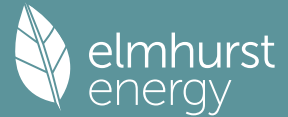


Space heating - main system 1	3445.9293	0.2100	723.6452 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3004.6884	0.2100	630.9846 (264)
Space and water heating			1354.6297 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	260.7818	0.1443	37.6389 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.0486	0.1348	-137.8137
PV Unit electricity exported	-1659.8878	0.1260	-209.1202
Total			-346.9339 (269)
Total CO2, kg/year			1057.2639 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3445.9293	1.1300	3893.9001 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3004.6884	1.1300	3395.2979 (278)
Space and water heating			7289.1981 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	260.7818	1.5338	399.9958 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.0486	1.4984	-1531.3994
PV Unit electricity exported	-1659.8878	0.4625	-767.6211
Total			-2299.0205 (283)
Total Primary energy kWh/year			5520.2742 (286)
Target Primary Energy Rate (TPER)			50.8700 (287)

Full SAP Calculation Printout



Property Reference	Baseline HOUSE 3				Issued on Date	07/11/2025
Assessment Reference	House 3		Prop Type Ref			
Property						
SAP Rating	73 C	DER	32.69	TER	13.68	
Environmental	72 C	% DER < TER				-138.96
CO ₂ Emissions (t/year)	2.37	DFEE	114.41	TFEE	45.84	
Compliance Check	See BREL	% DFEE < TFEE				-149.58
% DPER < TPER	-148.18	DPER	178.09	TPER	71.76	
Assessor Details	Ms. Vanessa Vienna				Assessor ID	T798-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.2700 (1b)	x 2.3000 (2b)	= 94.9210 (1b) - (3b)
First floor	41.2700 (1c)	x 2.3000 (2c)	= 94.9210 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 189.8420 (5)

2. Ventilation rate

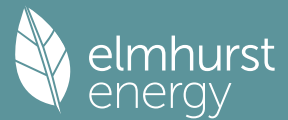
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (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	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Effective ac	0.8912	0.8760	0.8611	0.7912	0.7781	0.7172	0.7172	0.7059	0.7406	0.7781	0.8046	0.8322 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows upgraded			15.1700	1.5038	22.8120		(27)
Doors new			4.7300	1.6000	7.5680		(26)
Heatloss Floor 2			41.2700	0.2500	10.3175		(28a)
Upgraded wall	6.4300		6.4300	0.3000	1.9290		(29a)
New wall	7.4500	3.7300	3.7200	0.3000	1.1160		(29a)
match existing	13.1500		13.1500	0.3000	3.9450		(29a)
EXISTING WALL	126.0000	16.1700	109.8300	0.5500	60.4065		(29a)
Upgraded roof	41.2700		41.2700	0.1600	6.6032		(30)
Total net area of external elements Aum(A, m ²)			235.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	114.6972		(33)
Main dwelling							
Party Wall 1			21.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							47.1140 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	161.8112 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							

Full SAP Calculation Printout



(38)m	Jan 55.8316	Feb 54.8800	Mar 53.9471	Apr 49.5657	May 48.7460	Jun 44.9299	Jul 44.9299	Aug 44.2232	Sep 46.3998	Oct 48.7460	Nov 50.4043	Dec 52.1380	(38)
Heat transfer coeff	217.6429	216.6912	215.7584	211.3770	210.5572	206.7411	206.7411	206.0344	208.2110	210.5572	212.2156	213.9493	(39)
Average = Sum(39)m / 12 =												211.3730	
HLP	Jan 2.6368	Feb 2.6253	Mar 2.6140	Apr 2.5609	May 2.5510	Jun 2.5047	Jul 2.5047	Aug 2.4962	Sep 2.5225	Oct 2.5510	Nov 2.5711	Dec 2.5921	(40)
HLP (average)												2.5609	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5093	(42)
Hot water usage for mixer showers	66.2923	65.2960	63.8443	61.0667	59.0169	56.7310	55.4316	56.8724	58.4517	60.9061	63.7434	66.0383	(42a)	
Hot water usage for baths	30.1380	29.6904	29.0601	27.8979	27.0277	26.0628	25.5416	26.1675	26.8489	27.8814	29.0675	30.0361	(42b)	
Hot water usage for other uses	42.4502	40.9065	39.3629	37.8192	36.2756	34.7319	34.7319	36.2756	37.8192	39.3629	40.9065	42.4502	(42c)	
Average daily hot water use (litres/day)												127.6530	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	138.8804	135.8929	132.2673	126.7838	122.3202	117.5257	115.7052	119.3154	123.1199	128.1504	133.7174	138.5245	(44)	
Energy content (annual)	219.9526	193.5097	203.2898	173.5607	164.6665	144.5115	139.9354	147.7374	151.8191	173.8989	190.5050	216.8959	(45)	
Distribution loss (46)m = 0.15 x (45)m	32.9929	29.0265	30.4935	26.0341	24.7000	21.6767	20.9903	22.1606	22.7729	26.0848	28.5757	32.5344	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)	
Total heat required for water heating calculated for each month	270.9115	239.5371	254.2487	222.8758	215.6254	193.8266	190.8943	198.6963	201.1342	224.8578	239.8200	267.8548	(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	270.9115	239.5371	254.2487	222.8758	215.6254	193.8266	190.8943	198.6963	201.1342	224.8578	239.8200	267.8548	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2720.2826	(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)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000		
Heat gains from water heating, kWh/month	85.8740	75.8488	80.3336	70.0377	67.4913	60.3789	59.2682	61.8624	62.8086	70.5611	75.6717	84.8576	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 125.4645	Feb 125.4645	Mar 125.4645	Apr 125.4645	May 125.4645	Jun 125.4645	Jul 125.4645	Aug 125.4645	Sep 125.4645	Oct 125.4645	Nov 125.4645	Dec 125.4645	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.3652	127.7258	115.3652	119.2107	115.3652	119.2107	115.3652	115.3652	119.2107	115.3652	119.2107	115.3652	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.6671	226.9984	221.1235	208.6165	192.8287	177.9904	168.0775	165.7462	171.6211	184.1280	199.9159	214.7542	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	(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)	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	(71)
Water heating gains (Table 5)	115.4220	112.8703	107.9753	97.2746	90.7141	83.8595	79.6616	83.1484	87.2342	94.8402	105.0995	114.0559	(72)
Total internal gains	519.0937	531.2338	508.1034	488.7412	462.5475	441.7000	423.7437	424.8991	438.7053	457.9728	487.8655	507.8147	(73)

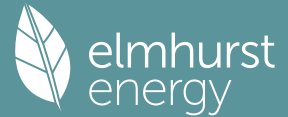
6. Solar gains

[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	
North				7.8800	10.6334	0.6300	0.7000	0.7700			25.6077 (74)	
East				2.7300	19.6403	0.6300	0.7000	0.7700			16.3863 (76)	
South				4.5600	46.7521	0.6300	0.7000	0.7700			65.1535 (78)	
Solar gains	107.1474	187.6973	271.8698	364.1848	434.3724	443.2722	422.3210	367.8496	303.3660	211.3808	129.2512	91.1217 (83)
Total gains	626.2411	718.9311	779.9732	852.9261	896.9198	884.9722	846.0647	792.7488	742.0714	669.3536	617.1167	598.9364 (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	26.3365	26.4521	26.5665	27.1172	27.2227	27.7252	27.7252	27.8203	27.5295	27.2227	27.0100	26.7911
alpha	2.7558	2.7635	2.7711	2.8078	2.8148	2.8483	2.8483	2.8547	2.8353	2.8148	2.8007	2.7861
util living area												
	0.9935	0.9899	0.9839	0.9690	0.9366	0.8662	0.7663	0.8026	0.9193	0.9750	0.9901	0.9943 (86)
MIT	18.5798	18.7570	19.0737	19.5493	20.0234	20.4575	20.6882	20.6489	20.3039	19.6982	19.0808	18.5766 (87)
Th 2	18.9426	18.9491	18.9554	18.9856	18.9913	19.0181	19.0181	19.0231	19.0077	18.9913	18.9798	18.9678 (88)
util rest of house												

Full SAP Calculation Printout



MIT 2	0.9909	0.9858	0.9767	0.9527	0.8949	0.7517	0.5286	0.5875	0.8436	0.9586	0.9853	0.9921 (89)
Living area fraction	16.2758	16.5058	16.9135	17.5337	18.1220	18.6311	18.8271	18.8102	18.4731	17.7310	16.9399	16.2872 (90)
MIT	16.8464	17.0633	17.4484	18.0328	18.5929	19.0834	19.2880	19.2656	fLA = Living area / (4) =			0.2476 (91)
Temperature adjustment									18.9265	18.2182	17.4701	16.8542 (92)
adjusted MIT	16.6964	16.9133	17.2984	17.8828	18.4429	18.9334	19.1380	19.1156	18.7765	18.0682	17.3201	-0.1500 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9792	0.9674	0.9389	0.8777	0.7447	0.5483	0.6019	0.8299	0.9460	0.9786	0.9880	(94)
Useful gains	617.6139	703.9520	754.5545	800.7884	787.2301	659.0129	463.9303	477.1181	615.8141	633.2343	603.9388	591.7269	(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	2697.9832	2603.1729	2329.8506	1898.7642	1419.7607	895.8951	524.7065	559.4984	973.7029	1572.4796	2168.8554	2675.2596	(97)
Space heating kWh	1547.7947	1276.2764	1172.0203	790.5425	470.6027	0.0000	0.0000	0.0000	0.0000	698.7985	1126.7399	1550.1483	(98a)
Space heating requirement - total per year (kWh/year)												8632.9235	
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	1547.7947	1276.2764	1172.0203	790.5425	470.6027	0.0000	0.0000	0.0000	0.0000	698.7985	1126.7399	1550.1483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8632.9235	
Space heating per m2											(98c) / (4) =	104.5908	(99)

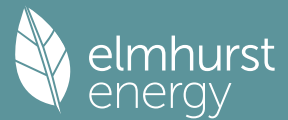
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1547.7947	1276.2764	1172.0203	790.5425	470.6027	0.0000	0.0000	0.0000	0.0000	698.7985	1126.7399	1550.1483 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	1729.3796	1426.0072	1309.5199	883.2878	525.8131	0.0000	0.0000	0.0000	0.0000	780.7804	1258.9273	1732.0093 (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	270.9115	239.5371	254.2487	222.8758	215.6254	193.8266	190.8943	198.6963	201.1342	224.8578	239.8200	267.8548 (64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	302.6944	267.6392	284.0768	249.0232	240.9222	216.5660	213.2897	222.0071	224.7309	251.2378	267.9553	299.2791 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	24.5259	19.6756	17.7157	12.9793	10.0256	8.1910	9.1456	11.8879	15.4412	20.2596	22.8832	25.2075 (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												9645.7246 (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												3039.4218 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												197.9380 (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												12924.0844 (238)

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

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

Full SAP Calculation Printout



Space heating - main system 1	9645.7246	0.2100	2025.6022 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3039.4218	0.2100	638.2786 (264)
Space and water heating			2663.8807 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	197.9380	0.1443	28.5686 (268)
Total CO2, kg/year			2698.1365 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			32.6900 (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	9645.7246	1.1300	10899.6688 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3039.4218	1.1300	3434.5467 (278)
Space and water heating			14334.2154 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	197.9380	1.5338	303.6039 (282)
Total Primary energy kWh/year			14699.8441 (286)
Dwelling Primary energy Rate (DPER)			178.0900 (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	41.2700 (1b)	x 2.3000 (2b)	= 94.9210 (1b) - (3b)
Ground floor	41.2700 (1c)	x 2.3000 (2c)	= 94.9210 (1c) - (3c)
First floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5400		(5)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.8420 (5)

2. Ventilation rate

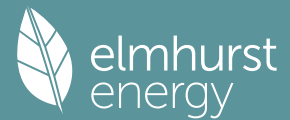
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1580 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4080 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3774 (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	0.4812	0.4718	0.4623	0.4152	0.4057	0.3586	0.3586	0.3491	0.3774	0.4057	0.4246	0.4435 (22b)
Effective ac	0.6158	0.6113	0.6069	0.5862	0.5823	0.5643	0.5643	0.5609	0.5712	0.5823	0.5901	0.5983 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			4.7300	1.0000	4.7300		(26)
TER Opening Type			15.1700	1.1450	17.3702		(27)
Heatloss Floor 2			41.2700	0.1300	5.3651		(28a)
Upgraded wall	6.4300		6.4300	0.1800	1.1574		(29a)
New wall	7.4500	3.7300	3.7200	0.1800	0.6696		(29a)
match existing	13.1500		13.1500	0.1800	2.3670		(29a)
EXISTING WALL	126.0000	16.1700	109.8300	0.1800	19.7694		(29a)
Upgraded roof	41.2700		41.2700	0.1100	4.5397		(30)
Total net area of external elements Aum(A, m2)			235.5700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.9684		(33)
Main dwelling							
Party Wall 1			21.0000	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)							11.7785 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	67.7469 (37)

Full SAP Calculation Printout



Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.5776	Feb 38.2959	Mar 38.0198	Apr 36.7230	May 36.4804	Jun 35.3509	Jul 35.3509	Aug 35.1418	Sep 35.7860	Oct 36.4804	Nov 36.9712	Dec 37.4844 (38)
Heat transfer coeff	106.3245	106.0428	105.7667	104.4700	104.2273	103.0979	103.0979	102.8887	103.5329	104.2273	104.7182	105.2313 (39)
Average = Sum(39)m / 12 =												104.4688
HLP	Jan 1.2882	Feb 1.2847	Mar 1.2814	Apr 1.2657	May 1.2627	Jun 1.2491	Jul 1.2491	Aug 1.2465	Sep 1.2543	Oct 1.2627	Nov 1.2687	Dec 1.2749 (40)
HLP (average)												1.2657
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5093 (42)
Hot water usage for mixer showers	66.2923	65.2960	63.8443	61.0667	59.0169	56.7310	55.4316	56.8724	58.4517	60.9061	63.7434	66.0383 (42a)
Hot water usage for baths	28.6311	28.2059	27.6071	26.5030	25.6763	24.7596	24.2645	24.8591	25.5065	26.4874	27.6142	28.5343 (42b)
Hot water usage for other uses	40.3276	38.8612	37.3947	35.9283	34.4618	32.9953	32.9953	34.4618	35.9283	37.3947	38.8612	40.3276 (42c)
Average daily hot water use (litres/day)												124.3263 (43)
Daily hot water use	135.2510	132.3631	128.8461	123.4980	119.1550	114.4859	112.6915	116.1933	119.8865	124.7882	130.2187	134.9002 (44)
Energy conte	214.2045	188.4833	198.0317	169.0626	160.4055	140.7738	136.2906	143.8715	147.8320	169.3364	185.5204	211.2211 (45)
Energy content (annual)												Total = Sum(45)m = 2065.0334
Distribution loss (46)m = 0.15 x (45)m	32.1307	28.2725	29.7048	25.3594	24.0608	21.1161	20.4436	21.5807	22.1748	25.4005	27.8281	31.6832 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	265.1634	234.5107	248.9906	218.3776	211.3645	190.0889	187.2495	194.8304	197.1471	220.2953	234.8355	262.1800 (62)
WWHRS	-30.3061	-26.8029	-28.0665	-23.2402	-21.6590	-18.5338	-17.3724	-18.4738	-19.1757	-22.6061	-25.6099	-29.7448 (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	234.8574	207.7077	220.9241	195.1375	189.7055	171.5551	169.8770	176.3566	177.9713	197.6892	209.2256	232.4352 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2383.4422 (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	83.9627	74.1775	78.5853	68.5421	66.0746	59.1361	58.0563	60.5770	61.4829	69.0441	74.0143	82.9707 (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	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.3652	127.7258	115.3652	119.2107	115.3652	119.2107	115.3652	115.3652	119.2107	115.3652	119.2107	115.3652 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.6671	226.9984	221.1235	208.6165	192.8287	177.9904	168.0775	165.7462	171.6211	184.1280	199.9159	214.7542 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716 (71)
Water heating gains (Table 5)	112.8531	110.3832	105.6253	95.1973	88.8099	82.1334	78.0327	81.4207	85.3929	92.8012	102.7977	111.5198 (72)
Total internal gains	516.5248	528.7468	505.7534	486.6639	460.6432	439.9739	422.1148	423.1715	436.8641	455.9338	485.5636	505.2786 (73)

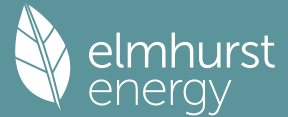
6. Solar gains

[Jan]												Gains
				Area	Solar flux	g	FF			Access		W
				m2	Table 6a	Specific data	Specific data			factor		
					W/m2	or Table 6b	or Table 6c			Table 6d		
North				7.8800	10.6334	0.6300	0.7000			0.7700		25.6077 (74)
East				2.7300	19.6403	0.6300	0.7000			0.7700		16.3863 (76)
South				4.5600	46.7521	0.6300	0.7000			0.7700		65.1535 (78)
Solar gains	107.1474	187.6973	271.8698	364.1848	434.3724	443.2722	422.3210	367.8496	303.3660	211.3808	129.2512	91.1217 (83)
Total gains	623.6722	716.4441	777.6232	850.8488	895.0156	883.2461	844.4358	791.0211	740.2301	667.3146	614.8148	596.4003 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.9099	54.0531	54.1942	54.8669	54.9946	55.5971	55.5971	55.7101	55.3635	54.9946	54.7369	54.4700
alpha	4.5940	4.6035	4.6129	4.6578	4.6663	4.7065	4.7065	4.7140	4.6909	4.6663	4.6491	4.6313
util living area	0.9947	0.9893	0.9780	0.9421	0.8547	0.6880	0.5235	0.5758	0.8093	0.9573	0.9894	0.9957 (86)
MIT	19.5365	19.7342	20.0194	20.4118	20.7399	20.9334	20.9852	20.9772	20.8531	20.4335	19.9229	19.5091 (87)
Th 2	19.8501	19.8528	19.8554	19.8678	19.8701	19.8809	19.8809	19.8830	19.8768	19.8701	19.8654	19.8605 (88)

Full SAP Calculation Printout



util rest of house	0.9929	0.9857	0.9703	0.9210	0.8024	0.5905	0.3973	0.4470	0.7268	0.9373	0.9852	0.9942 (89)
MIT 2	18.1691	18.4223	18.7845	19.2767	19.6523	19.8435	19.8764	19.8752	19.7785	19.3137	18.6729	18.1414 (90)
Living area fraction									FLA =	Living area /	(4) =	0.2476 (91)
MIT	18.5077	18.7472	19.0903	19.5578	19.9217	20.1134	20.1510	20.1481	20.0446	19.5910	18.9825	18.4801 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5077	18.7472	19.0903	19.5578	19.9217	20.1134	20.1510	20.1481	20.0446	19.5910	18.9825	18.4801 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9898	0.9808	0.9634	0.9138	0.8051	0.6122	0.4287	0.4789	0.7408	0.9309	0.9806	0.9916	(94)
Useful gains	617.3368	702.7149	749.1794	777.5044	720.6191	540.7263	362.0076	378.8408	548.3454	621.1788	602.8615	591.3930	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1510.6246	1468.3949	1331.6353	1113.4148	856.9219	568.4214	366.1019	385.6370	615.4606	937.1109	1244.3099	1502.7164	(97)
Space heating kWh	664.6062	514.5370	433.3472	241.8555	101.4093	0.0000	0.0000	0.0000	0.0000	235.0535	461.8428	678.0246	(98a)
Space heating requirement - total per year (kWh/year)												3330.6759	
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	664.6062	514.5370	433.3472	241.8555	101.4093	0.0000	0.0000	0.0000	0.0000	235.0535	461.8428	678.0246	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3330.6759	
Space heating per m2										(98c) / (4) =		40.3523	(99)

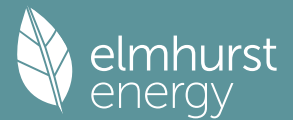
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	664.6062	514.5370	433.3472	241.8555	101.4093	0.0000	0.0000	0.0000	0.0000	235.0535	461.8428	678.0246 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	719.2707	556.8582	468.9905	261.7484	109.7503	0.0000	0.0000	0.0000	0.0000	254.3869	499.8299	733.7928 (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	234.8574	207.7077	220.9241	195.1375	189.7055	171.5551	169.8770	176.3566	177.9713	197.6892	209.2256	232.4352 (64)
Efficiency of water heater												80.3000 (216)
(217)m	86.4816	86.2437	85.7973	84.8425	83.1004	80.3000	80.3000	80.3000	80.3000	84.7534	86.0274	86.5340 (217)
Fuel for water heating, kWh/month	271.5691	240.8382	257.4954	229.9998	228.2848	213.6428	211.5530	219.6222	221.6330	233.2523	243.2079	268.6056 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	23.9706	19.2301	17.3146	12.6854	9.7986	8.0055	8.9386	11.6187	15.0916	19.8009	22.3651	24.6368 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-38.3704	-53.9725	-77.4093	-86.8390	-93.4719	-87.1783	-86.0858	-81.3392	-72.9535	-61.6050	-42.1341	-33.1867 (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	-22.0570	-46.3567	-92.0615	-138.1663	-182.5974	-183.4428	-181.2979	-153.5606	-112.6205	-66.2774	-29.4428	-17.4467 (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												3604.6276 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2839.7040 (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)												193.4566 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2039.8732 (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												4683.9150 (238)

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

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

Full SAP Calculation Printout



Space heating - main system 1	3604.6276	0.2100	756.9718 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2839.7040	0.2100	596.3378 (264)
Space and water heating			1353.3096 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.4566	0.1443	27.9218 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-814.5456	0.1346	-109.6671
PV Unit electricity exported	-1225.3276	0.1259	-154.2890
Total			-263.9561 (269)
Total CO2, kg/year			1129.2046 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6800 (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	3604.6276	1.1300	4073.2292 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2839.7040	1.1300	3208.8655 (278)
Space and water heating			7282.0947 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.4566	1.5338	296.7302 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-814.5456	1.4976	-1219.8587
PV Unit electricity exported	-1225.3276	0.4622	-566.3480
Total			-1786.2067 (283)
Total Primary energy kWh/year			5922.7190 (286)
Target Primary Energy Rate (TPER)			71.7600 (287)

Full SAP Calculation Printout



Property Reference	Baseline HOUSE 2				Issued on Date	07/11/2025	
Assessment Reference	House 2			Prop Type Ref			
Property							
SAP Rating	78 C		DER	24.13		TER	9.76
Environmental	77 C		% DER < TER				-147.23
CO ₂ Emissions (t/year)	2.41		DFEE	85.50		TFEE	35.01
Compliance Check	See BREL		% DFEE < TFEE				-144.18
% DPER < TPER	-158.66		DPER	131.86		TPER	50.98
Assessor Details	Ms. Vanessa Vienna					Assessor ID	T798-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	57.7100 (1b)	x 2.3000 (2b)	= 132.7330 (1b) - (3b)
First floor	57.7100 (1c)	x 2.3000 (2c)	= 132.7330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.4660 (5)

2. Ventilation rate

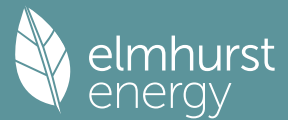
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (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	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Effective ac	0.8912	0.8760	0.8611	0.7912	0.7781	0.7172	0.7172	0.7059	0.7406	0.7781	0.8046	0.8322 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows upgraded			12.3900	1.5038	18.6316		(27)
Doors new			2.2600	1.6000	3.6160		(26)
new window			1.2600	1.5038	1.8947		(27)
Upgraded floor			57.7100	0.2500	14.4275		(28a)
Upgraded wall	26.7000	3.2400	23.4600	0.3000	7.0380		(29a)
New wall	32.6700	2.8100	29.8600	0.3000	8.9580		(29a)
match existing	34.1500		34.1500	0.5500	18.7825		(29a)
EXISTING WALL	27.7000	9.8600	17.8400	0.5500	9.8120		(29a)
Upgraded roof	57.7100		57.7100	0.1600	9.2336		(30)
Total net area of external elements Aum(A, m ²)			236.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.3939		(33)
Main dwelling							
Party Wall 1			82.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							47.3280 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	139.7219 (37)

Full SAP Calculation Printout



Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	78.0723	76.7415	75.4371	69.3103	68.1640	62.8278	62.8278	61.8396	64.8833	68.1640	70.4830	72.9074 (38)
Average = Sum(39)m / 12 =	217.7942	216.4634	215.1590	209.0323	207.8860	202.5497	202.5497	201.5616	204.6052	207.8860	210.2049	212.6293 (39)
												209.0268

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.8870	1.8754	1.8641	1.8111	1.8011	1.7549	1.7549	1.7463	1.7727	1.8011	1.8212	1.8422 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8437 (42)
Hot water usage for mixer showers	71.8999	70.8194	69.2449	66.2323	64.0091	61.5298	60.1206	61.6832	63.3961	66.0581	69.1354	71.6245 (42a)
Hot water usage for baths	32.6764	32.1911	31.5077	30.2476	29.3041	28.2579	27.6928	28.3714	29.1103	30.2298	31.5158	32.5659 (42b)
Hot water usage for other uses	46.0555	44.3807	42.7060	41.0313	39.3565	37.6818	37.6818	39.3565	41.0313	42.7060	44.3807	46.0555 (42c)
Average daily hot water use (litres/day)												138.4541 (43)
Daily hot water use	150.6318	147.3912	143.4586	137.5112	132.6698	127.4695	125.4952	129.4112	133.5377	138.9939	145.0319	150.2458 (44)
Energy conte	238.5639	209.8832	220.4905	188.2460	178.5990	156.7387	151.7756	160.2380	164.6653	188.6134	206.6246	235.2487 (45)
Energy content (annual)										Total = Sum(45)m =		2299.6868
Distribution loss (46)m = 0.15 x (45)m	35.7846	31.4825	33.0736	28.2369	26.7899	23.5108	22.7663	24.0357	24.6998	28.2920	30.9937	35.2873 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	289.5228	255.9106	271.4494	237.5611	229.5579	206.0537	202.7345	211.1969	213.9804	239.5723	255.9396	286.2076 (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	289.5228	255.9106	271.4494	237.5611	229.5579	206.0537	202.7345	211.1969	213.9804	239.5723	255.9396	286.2076 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2899.6868 (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	92.0622	81.2930	86.0528	74.9206	72.1239	64.4444	63.2051	66.0189	67.0800	75.4537	81.0314	90.9599 (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	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.7724	173.5694	156.7724	161.9981	156.7724	161.9981	156.7724	156.7724	161.9981	156.7724	161.9981	156.7724 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.1247	282.0211	274.7222	259.1836	239.5690	221.1339	208.8182	205.9218	213.2207	228.7593	248.3740	266.8090 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495 (71)
Water heating gains (Table 5)	123.7396	120.9717	115.6624	104.0563	96.9407	89.5061	84.9531	88.7350	93.1666	101.4163	112.5437	122.2579 (72)
Total internal gains	628.2927	645.2183	615.8130	593.8941	561.9381	538.2942	516.1998	517.0853	534.0416	555.6040	591.5718	614.4954 (73)

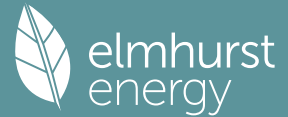
6. Solar gains

[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			
North				3.3800	10.6334	0.6300	0.7000	0.7700	10.9840 (74)			
East				3.1000	19.6403	0.6300	0.7000	0.7700	18.6072 (76)			
South				2.5200	46.7521	0.6300	0.7000	0.7700	36.0059 (78)			
West				3.3900	19.6403	0.6300	0.7000	0.7700	20.3479 (80)			
South				1.2600	46.7521	0.6300	0.7000	0.7700	18.0029 (78)			
Solar gains	103.9478	185.6478	273.8393	367.6689	434.1916	439.9519	420.5260	370.1585	306.5445	210.8142	126.1414	87.8601 (83)
Total gains	732.2405	830.8661	889.6523	961.5630	996.1297	978.2461	936.7258	887.2438	840.5861	766.4182	717.7132	702.3555 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	36.8021	37.0283	37.2528	38.3447	38.5561	39.5719	39.5719	39.7659	39.1744	38.5561	38.1308	37.6960
alpha	3.4535	3.4686	3.4835	3.5563	3.5704	3.6381	3.6381	3.6511	3.6116	3.5704	3.5421	3.5131
util living area	0.9968	0.9947	0.9909	0.9799	0.9523	0.8791	0.7645	0.8019	0.9315	0.9839	0.9948	0.9973 (86)

Full SAP Calculation Printout



MIT	19.1254	19.2755	19.5320	19.9267	20.3005	20.6415	20.8054	20.7801	20.5213	20.0370	19.5426	19.1360 (87)
Th 2	19.4098	19.4177	19.4254	19.4623	19.4692	19.5017	19.5017	19.5078	19.4892	19.4692	19.4552	19.4406 (88)
util rest of house												
	0.9957	0.9927	0.9871	0.9700	0.9233	0.7902	0.5790	0.6334	0.8751	0.9741	0.9924	0.9964 (89)
MIT 2	17.2766	17.4739	17.8069	18.3338	18.8028	19.2160	19.3565	19.3475	19.0850	18.4817	17.8424	17.3113 (90)
Living area fraction									fLA = Living area / (4) =			0.2145 (91)
MIT	17.6732	17.8603	18.1770	18.6755	19.1241	19.5218	19.6673	19.6548	19.3931	18.8154	18.2071	17.7027 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.5232	17.7103	18.0270	18.5255	18.9741	19.3718	19.5173	19.5048	19.2431	18.6654	18.0571	17.5527 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9892	0.9818	0.9609	0.9097	0.7796	0.5814	0.6330	0.8614	0.9659	0.9889	0.9944	(94)
Useful gains	727.4061	821.9256	873.4484	923.9226	906.2017	762.6845	544.6270	561.5962	724.1155	740.2600	709.7274	698.4401	(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													
Space heating kWh	2879.9304	2772.9697	2480.1363	2012.0391	1512.1864	966.5288	590.8976	625.8146	1052.3069	1676.6748	2303.2347	2839.1845	(97)
Space heating requirement - total per year (kWh/year)	1601.4780	1311.1016	1195.3758	783.4439	450.8526	0.0000	0.0000	0.0000	0.0000	696.6926	1147.3252	1592.7138	(98a)
Solar heating kWh												8778.9836	
Solar heating contribution - total per year (kWh/year)	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)
Space heating kWh	1601.4780	1311.1016	1195.3758	783.4439	450.8526	0.0000	0.0000	0.0000	0.0000	696.6926	1147.3252	1592.7138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8778.9836	
Space heating per m2											(98c) / (4) =	76.0612	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	1601.4780	1311.1016	1195.3758	783.4439	450.8526	0.0000	0.0000	0.0000	0.0000	696.6926	1147.3252	1592.7138	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	1789.3609	1464.9180	1335.6155	875.3563	503.7459	0.0000	0.0000	0.0000	0.0000	778.4275	1281.9276	1779.5685	(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	289.5228	255.9106	271.4494	237.5611	229.5579	206.0537	202.7345	211.1969	213.9804	239.5723	255.9396	286.2076	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	323.4892	285.9336	303.2954	265.4313	256.4893	230.2276	226.5190	235.9742	239.0842	267.6786	285.9661	319.7850	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	33.3288	26.7376	24.0742	17.6378	13.6240	11.1309	12.4282	16.1547	20.9833	27.5313	31.0965	34.2551	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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)	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												9808.9203	(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												3239.8736	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												268.9823	(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												13358.7762	(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	9808.9203	0.2100	2059.8733 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	3239.8736	0.2100	680.3734 (264)
Space and water heating			2740.2467 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	268.9823	0.1443	38.8225 (268)
Total CO2, kg/year			2784.7564 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			24.1300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	9808.9203	1.1300	11084.0799 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3239.8736	1.1300	3661.0571 (278)
Space and water heating			14745.1370 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	268.9823	1.5338	412.5741 (282)
Total Primary energy kWh/year			15219.7359 (286)
Dwelling Primary energy Rate (DPER)			131.8600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	57.7100 (1b)	x 2.3000 (2b)	= 132.7330 (1b) - (3b)
First floor	57.7100 (1c)	x 2.3000 (2c)	= 132.7330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	265.4660 (5)

2. Ventilation rate

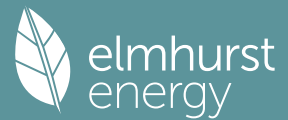
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1507 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4007 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3706 (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	0.4726	0.4633	0.4540	0.4077	0.3984	0.3521	0.3521	0.3428	0.3706	0.3984	0.4170	0.4355 (22b)
Effective ac	0.6117	0.6073	0.6031	0.5831	0.5794	0.5620	0.5620	0.5588	0.5687	0.5794	0.5869	0.5948 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type			13.6500	1.1450	15.6298		(27)
Upgraded floor			57.7100	0.1300	7.5023		(28a)
Upgraded wall	26.7000	3.2400	23.4600	0.1800	4.2228		(29a)
New wall	32.6700	2.8100	29.8600	0.1800	5.3748		(29a)
match existing	34.1500		34.1500	0.1800	6.1470		(29a)
EXISTING WALL	27.7000	9.8600	17.8400	0.1800	3.2112		(29a)
Upgraded roof	57.7100		57.7100	0.1100	6.3481		(30)
Total net area of external elements Aum (A, m2)			236.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6960		(33)
Main dwelling							
Party Wall 1			82.5000	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)							11.8320 (36)

Full SAP Calculation Printout



Point Thermal bridges
Total fabric heat loss (33) + (36) + (36a) = 0.0000
62.5280 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 53.5830	Feb 53.2032	Mar 52.8309	Apr 51.0823	May 50.7551	Jun 49.2321	Jul 49.2321	Aug 48.9500	Sep 49.8187	Oct 50.7551	Nov 51.4169	Dec 52.1089 (38)
Heat transfer coeff	116.1110	115.7312	115.3589	113.6102	113.2831	111.7601	111.7601	111.4780	112.3467	113.2831	113.9449	114.6369 (39)
Average = Sum(39)m / 12 =												113.6087
HLP	Jan 1.0060	Feb 1.0027	Mar 0.9995	Apr 0.9843	May 0.9815	Jun 0.9683	Jul 0.9683	Aug 0.9658	Sep 0.9734	Oct 0.9815	Nov 0.9872	Dec 0.9932 (40)
HLP (average)												0.9843
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8437 (42)
Hot water usage for mixer showers	71.8999	70.8194	69.2449	66.2323	64.0091	61.5298	60.1206	61.6832	63.3961	66.0581	69.1354	71.6245 (42a)
Hot water usage for baths	31.0425	30.5815	29.9323	28.7353	27.8389	26.8450	26.3082	26.9529	27.6548	28.7183	29.9400	30.9376 (42b)
Hot water usage for other uses	43.7527	42.1617	40.5707	38.9797	37.3887	35.7977	35.7977	37.3887	38.9797	40.5707	42.1617	43.7527 (42c)
Average daily hot water use (litres/day)												134.8459 (43)
Daily hot water use	Jan 146.6952	Feb 143.5626	Mar 139.7479	Apr 133.9473	May 129.2367	Jun 124.1725	Jul 122.2265	Aug 126.0248	Sep 130.0306	Oct 135.3471	Nov 141.2371	Dec 146.3148 (44)
Energy conte	232.3293	204.4313	214.7873	183.3671	173.9775	152.6846	147.8223	156.0450	160.3407	183.6648	201.2181	229.0936 (45)
Energy content (annual)												Total = Sum(45)m = 2239.7617
Distribution loss (46)m = 0.15 x (45)m	34.8494	30.6647	32.2181	27.5051	26.0966	22.9027	22.1733	23.4067	24.0511	27.5497	30.1827	34.3640 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	283.2882	250.4587	265.7462	232.6822	224.9364	201.9997	198.7812	207.0039	209.6558	234.6237	250.5332	280.0525 (62)
WWHRS	-32.8696	-29.0702	-30.4406	-25.2060	-23.4911	-20.1015	-18.8420	-20.0365	-20.7978	-24.5183	-27.7763	-32.2610 (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	250.4186	221.3885	235.3056	207.4762	201.4453	181.8982	179.9392	186.9673	188.8580	210.1053	222.7569	247.7915 (64)
12Total per year (kWh/year)												2534.3507 (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	89.9892	79.4803	84.1565	73.2983	70.5872	63.0964	61.8906	64.6247	65.6421	73.8083	79.2338	88.9133 (65)

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

Metabolic gains (Table 5), Watts	Jan 142.1869	Feb 142.1869	Mar 142.1869	Apr 142.1869	May 142.1869	Jun 142.1869	Jul 142.1869	Aug 142.1869	Sep 142.1869	Oct 142.1869	Nov 142.1869	Dec 142.1869 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.7724	173.5694	156.7724	161.9981	156.7724	161.9981	156.7724	156.7724	161.9981	156.7724	161.9981	156.7724 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.1247	282.0211	274.7222	259.1836	239.5690	221.1339	208.8182	205.9218	213.2207	228.7593	248.3740	266.8090 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187 (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)	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495 (71)
Water heating gains (Table 5)	120.9533	118.2742	113.1136	101.8032	94.8753	87.6339	83.1864	86.8611	91.1695	99.2047	110.0469	119.5072 (72)
Total internal gains	625.5064	642.5208	613.2642	591.6411	559.8727	536.4220	514.4330	515.2114	532.0444	553.3924	589.0751	611.7446 (73)

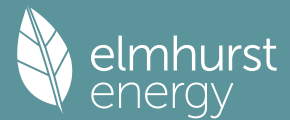
6. Solar gains

[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	
North				3.3800	10.6334	0.6300	0.7000		0.7700		10.9840 (74)	
East				3.1000	19.6403	0.6300	0.7000		0.7700		18.6072 (76)	
South				3.7800	46.7521	0.6300	0.7000		0.7700		54.0088 (78)	
West				3.3900	19.6403	0.6300	0.7000		0.7700		20.3479 (80)	
Solar gains	103.9478	185.6478	273.8393	367.6689	434.1916	439.9519	420.5260	370.1585	306.5445	210.8142	126.1414	87.8601 (83)
Total gains	729.4542	828.1686	887.1035	959.3099	994.0643	976.3739	934.9590	885.3699	838.5889	764.2066	715.2165	699.6047 (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)												
tau	Jan 69.0312	Feb 69.2577	Mar 69.4812	Apr 70.5507	May 70.7544	Jun 71.7186	Jul 71.7186	Aug 71.9001	Sep 71.3441	Oct 70.7544	Nov 70.3434	Dec 69.9189
alpha	5.6021	5.6172	5.6321	5.7034	5.7170	5.7812	5.7812	5.7933	5.7563	5.7170	5.6896	5.6613
util living area												

Full SAP Calculation Printout



	0.9974	0.9941	0.9866	0.9574	0.8747	0.6957	0.5198	0.5686	0.8165	0.9687	0.9940	0.9979 (86)
MIT	19.8445	20.0075	20.2385	20.5630	20.8237	20.9654	20.9945	20.9910	20.9132	20.5805	20.1645	19.8262 (87)
Mth 2	20.0783	20.0811	20.0838	20.0964	20.0988	20.1098	20.1098	20.1119	20.1056	20.0988	20.0940	20.0890 (88)
util rest of house												
	0.9965	0.9922	0.9820	0.9421	0.8318	0.6137	0.4179	0.4643	0.7462	0.9545	0.9917	0.9973 (89)
MIT 2	18.7258	18.9358	19.2311	19.6439	19.9457	20.0894	20.1080	20.1086	20.0453	19.6726	19.1467	18.7103 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.9658	19.1657	19.4472	19.8410	20.1340	20.2773	20.2982	20.2979	20.2314	19.8673	19.3650	18.9497 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9658	19.1657	19.4472	19.8410	20.1340	20.2773	20.2982	20.2979	20.2314	19.8673	19.3650	18.9497 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9950	0.9896	0.9777	0.9368	0.8337	0.6300	0.4398	0.4867	0.7571	0.9498	0.9891	0.9960 (94)
Useful gains	725.8306	819.5155	867.3234	898.6719	828.7937	615.0681	411.2407	430.9153	634.9283	725.8150	707.4044	696.8222 (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	1702.8614	1650.9874	1493.5700	1243.0145	955.4323	634.5009	413.3061	434.5261	688.8479	1049.8334	1397.5376	1690.8615 (97)
Space heating kWh	726.9109	558.7492	465.9274	247.9267	94.2191	0.0000	0.0000	0.0000	0.0000	241.0697	496.8959	739.5652 (98a)
Space heating requirement - total per year (kWh/year)												3571.2641
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	726.9109	558.7492	465.9274	247.9267	94.2191	0.0000	0.0000	0.0000	0.0000	241.0697	496.8959	739.5652 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3571.2641
Space heating per m2										(98c) / (4) =		30.9415 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	726.9109	558.7492	465.9274	247.9267	94.2191	0.0000	0.0000	0.0000	0.0000	241.0697	496.8959	739.5652 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	786.7001	604.7069	504.2505	268.3189	101.9687	0.0000	0.0000	0.0000	0.0000	260.8979	537.7661	800.3953 (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	250.4186	221.3885	235.3056	207.4762	201.4453	181.8982	179.9392	186.9673	188.8580	210.1053	222.7569	247.7915 (64)
Efficiency of water heater (217)m	86.5256	86.2778	85.8160	84.7641	82.8542	80.3000	80.3000	80.3000	80.3000	84.6768	86.0475	86.5731 (217)
Fuel for water heating, kWh/month	289.4156	256.5996	274.1980	244.7688	243.1323	226.5233	224.0837	232.8360	235.1905	248.1262	258.8768	286.2223 (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	32.5742	26.1322	23.5292	17.2385	13.3155	10.8789	12.1468	15.7889	20.5083	26.9079	30.3925	33.4795 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.0728	-72.4292	-102.6890	-113.7765	-121.2168	-112.5468	-111.1025	-105.5899	-95.6623	-82.0010	-56.8790	-45.1318 (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	-32.4260	-67.8664	-134.2908	-200.8601	-264.8253	-265.8769	-262.7941	-222.8828	-163.8356	-96.8236	-43.2107	-25.6714 (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												3865.0045 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3019.9731 (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)												262.8925 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2852.4613 (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												4381.4088 (238)

Full SAP Calculation Printout



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	3865.0045	0.2100	811.6509 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3019.9731	0.2100	634.1944 (264)
Space and water heating			1445.8453 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	262.8925	0.1443	37.9435 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1071.0975	0.1349	-144.4908
PV Unit electricity exported	-1781.3638	0.1260	-224.4766
Total			-368.9674 (269)
Total CO2, kg/year			1126.7506 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7600 (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	3865.0045	1.1300	4367.4551 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3019.9731	1.1300	3412.5696 (278)
Space and water heating			7780.0247 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	262.8925	1.5338	403.2333 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1071.0975	1.4986	-1605.1301
PV Unit electricity exported	-1781.3638	0.4626	-823.9923
Total			-2429.1224 (283)
Total Primary energy kWh/year			5884.2364 (286)
Target Primary Energy Rate (TPER)			50.9800 (287)

Energy Assessment

The Dower House, 393 High Street

eight
versa

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

Be Lean refurbishment - DER from the Be Lean scenario DER SAP worksheet

Full SAP Calculation Printout



Space heating - main system 1	9794.9335	0.2100	2056.9360 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3039.4218	0.2100	638.2786 (264)
Space and water heating			2695.2146 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	195.3366	0.1443	28.1931 (268)
Total CO2, kg/year			2729.0949 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			33.0600 (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	9794.9335	1.1300	11068.2748 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3039.4218	1.1300	3434.5467 (278)
Space and water heating			14502.8215 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	195.3366	1.5338	299.6138 (282)
Total Primary energy kWh/year			14864.4601 (286)
Dwelling Primary energy Rate (DPER)			180.0900 (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	41.2700 (1b)	x 2.3000 (2b)	= 94.9210 (1b) - (3b)
Ground floor	41.2700 (1c)	x 2.3000 (2c)	= 94.9210 (1c) - (3c)
First floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5400		(5)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.8420 (5)

2. Ventilation rate

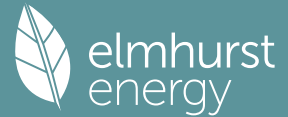
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1580 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4080 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3774 (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	0.4812	0.4718	0.4623	0.4152	0.4057	0.3586	0.3586	0.3491	0.3774	0.4057	0.4246	0.4435 (22b)
Effective ac	0.6158	0.6113	0.6069	0.5862	0.5823	0.5643	0.5643	0.5609	0.5712	0.5823	0.5901	0.5983 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			4.7300	1.0000	4.7300		(26)
TER Opening Type			15.1700	1.1450	17.3702		(27)
Heatloss Floor 2			41.2700	0.1300	5.3651		(28a)
Upgraded wall	6.4300		6.4300	0.1800	1.1574		(29a)
New wall	7.4500	3.7300	3.7200	0.1800	0.6696		(29a)
match existing	13.1500		13.1500	0.1800	2.3670		(29a)
EXISTING WALL	126.0000	16.1700	109.8300	0.1800	19.7694		(29a)
Upgraded roof	41.2700		41.2700	0.1100	4.5397		(30)
Total net area of external elements Aum(A, m2)			235.5700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.9684		(33)
Main dwelling							
Party Wall 1			21.0000	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)							11.7785 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	67.7469 (37)

Full SAP Calculation Printout



Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.5776	Feb 38.2959	Mar 38.0198	Apr 36.7230	May 36.4804	Jun 35.3509	Jul 35.3509	Aug 35.1418	Sep 35.7860	Oct 36.4804	Nov 36.9712	Dec 37.4844 (38)
Heat transfer coeff	106.3245	106.0428	105.7667	104.4700	104.2273	103.0979	103.0979	102.8887	103.5329	104.2273	104.7182	105.2313 (39)
Average = Sum(39)m / 12 =												104.4688
HLP	Jan 1.2882	Feb 1.2847	Mar 1.2814	Apr 1.2657	May 1.2627	Jun 1.2491	Jul 1.2491	Aug 1.2465	Sep 1.2543	Oct 1.2627	Nov 1.2687	Dec 1.2749 (40)
HLP (average)												1.2657
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5093 (42)
Hot water usage for mixer showers	66.2923	65.2960	63.8443	61.0667	59.0169	56.7310	55.4316	56.8724	58.4517	60.9061	63.7434	66.0383 (42a)
Hot water usage for baths	28.6311	28.2059	27.6071	26.5030	25.6763	24.7596	24.2645	24.8591	25.5065	26.4874	27.6142	28.5343 (42b)
Hot water usage for other uses	40.3276	38.8612	37.3947	35.9283	34.4618	32.9953	32.9953	34.4618	35.9283	37.3947	38.8612	40.3276 (42c)
Average daily hot water use (litres/day)												124.3263 (43)
Daily hot water use	135.2510	132.3631	128.8461	123.4980	119.1550	114.4859	112.6915	116.1933	119.8865	124.7882	130.2187	134.9002 (44)
Energy conte	214.2045	188.4833	198.0317	169.0626	160.4055	140.7738	136.2906	143.8715	147.8320	169.3364	185.5204	211.2211 (45)
Energy content (annual)												Total = Sum(45)m = 2065.0334
Distribution loss (46)m = 0.15 x (45)m	32.1307	28.2725	29.7048	25.3594	24.0608	21.1161	20.4436	21.5807	22.1748	25.4005	27.8281	31.6832 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	265.1634	234.5107	248.9906	218.3776	211.3645	190.0889	187.2495	194.8304	197.1471	220.2953	234.8355	262.1800 (62)
WWHRS	-30.3061	-26.8029	-28.0665	-23.2402	-21.6590	-18.5338	-17.3724	-18.4738	-19.1757	-22.6061	-25.6099	-29.7448 (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	234.8574	207.7077	220.9241	195.1375	189.7055	171.5551	169.8770	176.3566	177.9713	197.6892	209.2256	232.4352 (64)
12Total per year (kWh/year)												2383.4422 (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	83.9627	74.1775	78.5853	68.5421	66.0746	59.1361	58.0563	60.5770	61.4829	69.0441	74.0143	82.9707 (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	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.3652	127.7258	115.3652	119.2107	115.3652	119.2107	115.3652	115.3652	119.2107	115.3652	119.2107	115.3652 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.6671	226.9984	221.1235	208.6165	192.8287	177.9904	168.0775	165.7462	171.6211	184.1280	199.9159	214.7542 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716 (71)
Water heating gains (Table 5)	112.8531	110.3832	105.6253	95.1973	88.8099	82.1334	78.0327	81.4207	85.3929	92.8012	102.7977	111.5198 (72)
Total internal gains	516.5248	528.7468	505.7534	486.6639	460.6432	439.9739	422.1148	423.1715	436.8641	455.9338	485.5636	505.2786 (73)

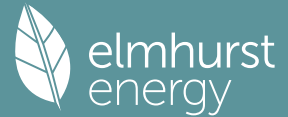
6. Solar gains

[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	
North				7.8800	10.6334	0.6300	0.7000		0.7700		25.6077 (74)	
East				2.7300	19.6403	0.6300	0.7000		0.7700		16.3863 (76)	
South				4.5600	46.7521	0.6300	0.7000		0.7700		65.1535 (78)	
Solar gains	107.1474	187.6973	271.8698	364.1848	434.3724	443.2722	422.3210	367.8496	303.3660	211.3808	129.2512	91.1217 (83)
Total gains	623.6722	716.4441	777.6232	850.8488	895.0156	883.2461	844.4358	791.0211	740.2301	667.3146	614.8148	596.4003 (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 from living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.9099	54.0531	54.1942	54.8669	54.9946	55.5971	55.5971	55.7101	55.3635	54.9946	54.7369	54.4700
alpha	4.5940	4.6035	4.6129	4.6578	4.6663	4.7065	4.7065	4.7140	4.6909	4.6663	4.6491	4.6313
util living area	0.9947	0.9893	0.9780	0.9421	0.8547	0.6880	0.5235	0.5758	0.8093	0.9573	0.9894	0.9957 (86)
MIT	19.5365	19.7342	20.0194	20.4118	20.7399	20.9334	20.9852	20.9772	20.8531	20.4335	19.9229	19.5091 (87)
Th 2	19.8501	19.8528	19.8554	19.8678	19.8701	19.8809	19.8809	19.8830	19.8768	19.8701	19.8654	19.8605 (88)

Full SAP Calculation Printout



util rest of house	0.9929	0.9857	0.9703	0.9210	0.8024	0.5905	0.3973	0.4470	0.7268	0.9373	0.9852	0.9942 (89)
MIT 2	18.1691	18.4223	18.7845	19.2767	19.6523	19.8435	19.8764	19.8752	19.7785	19.3137	18.6729	18.1414 (90)
Living area fraction									FLA =	Living area /	(4) =	0.2476 (91)
MIT	18.5077	18.7472	19.0903	19.5578	19.9217	20.1134	20.1510	20.1481	20.0446	19.5910	18.9825	18.4801 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5077	18.7472	19.0903	19.5578	19.9217	20.1134	20.1510	20.1481	20.0446	19.5910	18.9825	18.4801 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9898	0.9808	0.9634	0.9138	0.8051	0.6122	0.4287	0.4789	0.7408	0.9309	0.9806	0.9916	(94)
Useful gains	617.3368	702.7149	749.1794	777.5044	720.6191	540.7263	362.0076	378.8408	548.3454	621.1788	602.8615	591.3930	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1510.6246	1468.3949	1331.6353	1113.4148	856.9219	568.4214	366.1019	385.6370	615.4606	937.1109	1244.3099	1502.7164	(97)
Space heating kWh	664.6062	514.5370	433.3472	241.8555	101.4093	0.0000	0.0000	0.0000	0.0000	235.0535	461.8428	678.0246	(98a)
Space heating requirement - total per year (kWh/year)												3330.6759	
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	664.6062	514.5370	433.3472	241.8555	101.4093	0.0000	0.0000	0.0000	0.0000	235.0535	461.8428	678.0246	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3330.6759	
Space heating per m2										(98c) / (4) =		40.3523	(99)

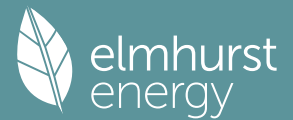
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	664.6062	514.5370	433.3472	241.8555	101.4093	0.0000	0.0000	0.0000	0.0000	235.0535	461.8428	678.0246 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	719.2707	556.8582	468.9905	261.7484	109.7503	0.0000	0.0000	0.0000	0.0000	254.3869	499.8299	733.7928 (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	234.8574	207.7077	220.9241	195.1375	189.7055	171.5551	169.8770	176.3566	177.9713	197.6892	209.2256	232.4352 (64)
Efficiency of water heater												80.3000 (216)
(217)m	86.4816	86.2437	85.7973	84.8425	83.1004	80.3000	80.3000	80.3000	80.3000	84.7534	86.0274	86.5340 (217)
Fuel for water heating, kWh/month	271.5691	240.8382	257.4954	229.9998	228.2848	213.6428	211.5530	219.6222	221.6330	233.2523	243.2079	268.6056 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	23.9706	19.2301	17.3146	12.6854	9.7986	8.0055	8.9386	11.6187	15.0916	19.8009	22.3651	24.6368 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-38.3704	-53.9725	-77.4093	-86.8390	-93.4719	-87.1783	-86.0858	-81.3392	-72.9535	-61.6050	-42.1341	-33.1867 (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	-22.0570	-46.3567	-92.0615	-138.1663	-182.5974	-183.4428	-181.2979	-153.5606	-112.6205	-66.2774	-29.4428	-17.4467 (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												3604.6276 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2839.7040 (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)												193.4566 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2039.8732 (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												4683.9150 (238)

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

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

Full SAP Calculation Printout



Space heating - main system 1	3604.6276	0.2100	756.9718 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2839.7040	0.2100	596.3378 (264)
Space and water heating			1353.3096 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.4566	0.1443	27.9218 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-814.5456	0.1346	-109.6671
PV Unit electricity exported	-1225.3276	0.1259	-154.2890
Total			-263.9561 (269)
Total CO2, kg/year			1129.2046 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6800 (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	3604.6276	1.1300	4073.2292 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2839.7040	1.1300	3208.8655 (278)
Space and water heating			7282.0947 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.4566	1.5338	296.7302 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-814.5456	1.4976	-1219.8587
PV Unit electricity exported	-1225.3276	0.4622	-566.3480
Total			-1786.2067 (283)
Total Primary energy kWh/year			5922.7190 (286)
Target Primary Energy Rate (TPER)			71.7600 (287)

Full SAP Calculation Printout



Property Reference	Dower HOUSE 2			Issued on Date	07/11/2025
Assessment Reference	House 2	Prop Type Ref			
Property					
SAP Rating	78 C	DER	23.80	TER	9.76
Environmental	77 C	% DER < TER			-143.85
CO ₂ Emissions (t/year)	2.37	DFEE	84.22	TFEE	35.01
Compliance Check	See BREL	% DFEE < TFEE			-140.56
% DPER < TPER	-155.13	DPER	130.06	TPER	50.98
Assessor Details	Ms. Vanessa Vienna			Assessor ID	T798-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	57.7100 (1b)	x 2.3000 (2b)	= 132.7330 (1b) - (3b)
First floor	57.7100 (1c)	x 2.3000 (2c)	= 132.7330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.4660 (5)

2. Ventilation rate

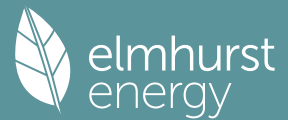
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (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	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Effective ac	0.8912	0.8760	0.8611	0.7912	0.7781	0.7172	0.7172	0.7059	0.7406	0.7781	0.8046	0.8322 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows upgraded			12.3900	1.8519	22.9444		(27)
Doors new			2.2600	1.4000	3.1640		(26)
new window			1.2600	1.3258	1.6705		(27)
Upgraded floor			57.7100	0.2500	14.4275		(28a)
Upgraded wall	26.7000	3.2400	23.4600	0.3000	7.0380		(29a)
New wall	32.6700	2.8100	29.8600	0.1800	5.3748		(29a)
match existing	34.1500		34.1500	0.5500	18.7825		(29a)
EXISTING WALL	27.7000	9.8600	17.8400	0.5500	9.8120		(29a)
Upgraded roof	57.7100		57.7100	0.1600	9.2336		(30)
Total net area of external elements Aum(A, m ²)			236.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.4473		(33)
Main dwelling							
Party Wall 1			82.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							47.3280 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	139.7753 (37)

Full SAP Calculation Printout



Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	78.0723	76.7415	75.4371	69.3103	68.1640	62.8278	62.8278	61.8396	64.8833	68.1640	70.4830	72.9074 (38)
Average = Sum(39)m / 12 =	217.8476	216.5168	215.2124	209.0856	207.9393	202.6031	202.6031	201.6149	204.6586	207.9393	210.2583	212.6827 (39)
												209.0802
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.8874	1.8759	1.8646	1.8115	1.8016	1.7554	1.7554	1.7468	1.7732	1.8016	1.8217	1.8427 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

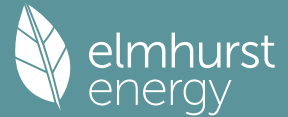
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.8437 (42)
Hot water usage for mixer showers												
	71.8999	70.8194	69.2449	66.2323	64.0091	61.5298	60.1206	61.6832	63.3961	66.0581	69.1354	71.6245 (42a)
Hot water usage for baths												
	32.6764	32.1911	31.5077	30.2476	29.3041	28.2579	27.6928	28.3714	29.1103	30.2298	31.5158	32.5659 (42b)
Hot water usage for other uses												
	46.0555	44.3807	42.7060	41.0313	39.3565	37.6818	37.6818	39.3565	41.0313	42.7060	44.3807	46.0555 (42c)
Average daily hot water use (litres/day)												138.4541 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	150.6318	147.3912	143.4586	137.5112	132.6698	127.4695	125.4952	129.4112	133.5377	138.9939	145.0319	150.2458 (44)
Energy content (annual)	238.5639	209.8832	220.4905	188.2460	178.5990	156.7387	151.7756	160.2380	164.6653	188.6134	206.6246	235.2487 (45)
Distribution loss (46)m = 0.15 x (45)m												
	35.7846	31.4825	33.0736	28.2369	26.7899	23.5108	22.7663	24.0357	24.6998	28.2920	30.9937	35.2873 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	289.5228	255.9106	271.4494	237.5611	229.5579	206.0537	202.7345	211.1969	213.9804	239.5723	255.9396	286.2076 (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												
	289.5228	255.9106	271.4494	237.5611	229.5579	206.0537	202.7345	211.1969	213.9804	239.5723	255.9396	286.2076 (64)
12Total per year (kWh/year)												2899.6868 (64)
Electric shower(s)												2900 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	92.0622	81.2930	86.0528	74.9206	72.1239	64.4444	63.2051	66.0189	67.0800	75.4537	81.0314	90.9599 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.7724	173.5694	156.7724	161.9981	156.7724	161.9981	156.7724	156.7724	161.9981	156.7724	161.9981	156.7724 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	279.1247	282.0211	274.7222	259.1836	239.5690	221.1339	208.8182	205.9218	213.2207	228.7593	248.3740	266.8090 (68)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495 (71)
Water heating gains (Table 5)												
	123.7396	120.9717	115.6624	104.0563	96.9407	89.5061	84.9531	88.7350	93.1666	101.4163	112.5437	122.2579 (72)
Total internal gains	628.2927	645.2183	615.8130	593.8941	561.9381	538.2942	516.1998	517.0853	534.0416	555.6040	591.5718	614.4954 (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
North					3.3800	10.6334	0.7600	0.7000		0.7700		13.2505 (74)
East					3.1000	19.6403	0.7600	0.7000		0.7700		22.4468 (76)
South					2.5200	46.7521	0.7600	0.7000		0.7700		43.4356 (78)
West					3.3900	19.6403	0.7600	0.7000		0.7700		24.5466 (80)
South					1.2600	46.7521	0.6000	0.7000		0.7700		17.1456 (78)
Solar gains	120.8252	216.4680	320.8074	432.7565	512.5527	519.9244	496.7381	436.2822	359.8357	246.2390	146.7510	102.0392 (83)
Total gains	749.1179	861.6864	936.6204	1026.6507	1074.4908	1058.2187	1012.9378	953.3674	893.8773	801.8430	738.3228	716.5345 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	36.7931	37.0192	37.2436	38.3349	38.5462	39.5615	39.5615	39.7554	39.1641	38.5462	38.1211	37.6866
util living area	3.4529	3.4679	3.4829	3.5557	3.5697	3.6374	3.6374	3.6504	3.6109	3.5697	3.5414	3.5124
	0.9966	0.9941	0.9894	0.9755	0.9415	0.8561	0.7317	0.7740	0.9199	0.9816	0.9943	0.9972 (86)

Full SAP Calculation Printout



MIT	19.1352	19.2936	19.5594	19.9632	20.3394	20.6701	20.8210	20.7965	20.5456	20.0572	19.5547	19.1442 (87)
Th 2	19.4094	19.4173	19.4251	19.4619	19.4689	19.5014	19.5014	19.5075	19.4888	19.4689	19.4549	19.4403 (88)
util rest of house												
	0.9953	0.9918	0.9849	0.9638	0.9075	0.7588	0.5437	0.6004	0.8570	0.9704	0.9917	0.9961 (89)
MIT 2	17.2888	17.4967	17.8413	18.3784	18.8465	19.2396	19.3628	19.3555	19.1089	18.5064	17.8575	17.3216 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	17.6849	17.8821	18.2098	18.7184	19.1668	19.5465	19.6756	19.6646	19.4171	18.8390	18.2216	17.7126 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.5349	17.7321	18.0598	18.5684	19.0168	19.3965	19.5256	19.5146	19.2671	18.6890	18.0716	17.5626 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9880	0.9790	0.9536	0.8934	0.7498	0.5475	0.6015	0.8436	0.9615	0.9879	0.9941	(94)
Useful gains	743.8223	851.3779	916.9302	979.0590	959.9143	793.4251	554.5477	573.4536	754.1184	770.9937	729.3901	712.2870	(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													
Space heating kWh	2883.1954	2778.3712	2487.8212	2021.5219	1521.4472	971.7877	592.7454	627.9591	1057.4990	1682.0298	2306.8712	2841.9923	(97)
Space heating requirement - total per year (kWh/year)	1591.6936	1294.9395	1168.7429	750.5733	417.7805	0.0000	0.0000	0.0000	0.0000	677.8109	1135.7863	1584.5007	(98a)
Solar heating kWh												8621.8276	
Solar heating contribution - total per year (kWh/year)	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)
Space heating kWh	1591.6936	1294.9395	1168.7429	750.5733	417.7805	0.0000	0.0000	0.0000	0.0000	677.8109	1135.7863	1584.5007	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8621.8276	
Space heating per m2											(98c) / (4) =	74.6996	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1591.6936	1294.9395	1168.7429	750.5733	417.7805	0.0000	0.0000	0.0000	0.0000	677.8109	1135.7863	1584.5007	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	1778.4285	1446.8598	1305.8579	838.6294	466.7938	0.0000	0.0000	0.0000	0.0000	757.3306	1269.0350	1770.3919	(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	289.5228	255.9106	271.4494	237.5611	229.5579	206.0537	202.7345	211.1969	213.9804	239.5723	255.9396	286.2076	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	323.4892	285.9336	303.2954	265.4313	256.4893	230.2276	226.5190	235.9742	239.0842	267.6786	285.9661	319.7850	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	32.5742	26.1322	23.5292	17.2385	13.3155	10.8789	12.1468	15.7889	20.5083	26.9079	30.3925	33.4795	(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												9633.3270	(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												3239.8736	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												262.8925	(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												13177.0930	(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	9633.3270	0.2100	2022.9987 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3239.8736	0.2100	680.3734 (264)
Space and water heating			2703.3721 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	262.8925	0.1443	37.9435 (268)
Total CO2, kg/year			2747.0028 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			23.8000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	9633.3270	1.1300	10885.6595 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3239.8736	1.1300	3661.0571 (278)
Space and water heating			14546.7166 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	262.8925	1.5338	403.2333 (282)
Total Primary energy kWh/year			15011.9747 (286)
Dwelling Primary energy Rate (DPER)			130.0600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	57.7100 (1b)	x 2.3000 (2b)	= 132.7330 (1b) - (3b)
First floor	57.7100 (1c)	x 2.3000 (2c)	= 132.7330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	265.4660 (5)

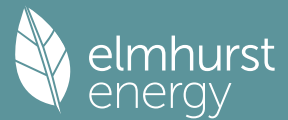
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1507 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4007 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3706 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.4726 0.4633 0.4540 0.4077 0.3984 0.3521 0.3521 0.3428 0.3706 0.3984 0.4170 0.4355 (22b)
Effective ac	0.6117 0.6073 0.6031 0.5831 0.5794 0.5620 0.5620 0.5588 0.5687 0.5794 0.5869 0.5948 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type			13.6500	1.1450	15.6298		(27)
Upgraded floor			57.7100	0.1300	7.5023		(28a)
Upgraded wall	26.7000	3.2400	23.4600	0.1800	4.2228		(29a)
New wall	32.6700	2.8100	29.8600	0.1800	5.3748		(29a)
match existing	34.1500		34.1500	0.1800	6.1470		(29a)
EXISTING WALL	27.7000	9.8600	17.8400	0.1800	3.2112		(29a)
Upgraded roof	57.7100		57.7100	0.1100	6.3481		(30)
Total net area of external elements Aum (A, m2)			236.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6960		(33)
Main dwelling							
Party Wall 1			82.5000	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)							11.8320 (36)

Full SAP Calculation Printout



Point Thermal bridges
Total fabric heat loss (33) + (36) + (36a) = 0.0000
62.5280 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 53.5830	Feb 53.2032	Mar 52.8309	Apr 51.0823	May 50.7551	Jun 49.2321	Jul 49.2321	Aug 48.9500	Sep 49.8187	Oct 50.7551	Nov 51.4169	Dec 52.1089 (38)
Heat transfer coeff	116.1110	115.7312	115.3589	113.6102	113.2831	111.7601	111.7601	111.4780	112.3467	113.2831	113.9449	114.6369 (39)
Average = Sum(39)m / 12 =												113.6087
HLP	Jan 1.0060	Feb 1.0027	Mar 0.9995	Apr 0.9843	May 0.9815	Jun 0.9683	Jul 0.9683	Aug 0.9658	Sep 0.9734	Oct 0.9815	Nov 0.9872	Dec 0.9932 (40)
HLP (average)												0.9843
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8437 (42)
Hot water usage for mixer showers	71.8999	70.8194	69.2449	66.2323	64.0091	61.5298	60.1206	61.6832	63.3961	66.0581	69.1354	71.6245 (42a)
Hot water usage for baths	31.0425	30.5815	29.9323	28.7353	27.8389	26.8450	26.3082	26.9529	27.6548	28.7183	29.9400	30.9376 (42b)
Hot water usage for other uses	43.7527	42.1617	40.5707	38.9797	37.3887	35.7977	35.7977	37.3887	38.9797	40.5707	42.1617	43.7527 (42c)
Average daily hot water use (litres/day)												134.8459 (43)
Daily hot water use	Jan 146.6952	Feb 143.5626	Mar 139.7479	Apr 133.9473	May 129.2367	Jun 124.1725	Jul 122.2265	Aug 126.0248	Sep 130.0306	Oct 135.3471	Nov 141.2371	Dec 146.3148 (44)
Energy conte	232.3293	204.4313	214.7873	183.3671	173.9775	152.6846	147.8223	156.0450	160.3407	183.6648	201.2181	229.0936 (45)
Energy content (annual)												Total = Sum(45)m = 2239.7617
Distribution loss (46)m = 0.15 x (45)m	34.8494	30.6647	32.2181	27.5051	26.0966	22.9027	22.1733	23.4067	24.0511	27.5497	30.1827	34.3640 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	283.2882	250.4587	265.7462	232.6822	224.9364	201.9997	198.7812	207.0039	209.6558	234.6237	250.5332	280.0525 (62)
WWHRS	-32.8696	-29.0702	-30.4406	-25.2060	-23.4911	-20.1015	-18.8420	-20.0365	-20.7978	-24.5183	-27.7763	-32.2610 (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	250.4186	221.3885	235.3056	207.4762	201.4453	181.8982	179.9392	186.9673	188.8580	210.1053	222.7569	247.7915 (64)
12Total per year (kWh/year)												2534.3507 (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	89.9892	79.4803	84.1565	73.2983	70.5872	63.0964	61.8906	64.6247	65.6421	73.8083	79.2338	88.9133 (65)

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

Metabolic gains (Table 5), Watts	Jan 142.1869	Feb 142.1869	Mar 142.1869	Apr 142.1869	May 142.1869	Jun 142.1869	Jul 142.1869	Aug 142.1869	Sep 142.1869	Oct 142.1869	Nov 142.1869	Dec 142.1869 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.7724	173.5694	156.7724	161.9981	156.7724	161.9981	156.7724	156.7724	161.9981	156.7724	161.9981	156.7724 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.1247	282.0211	274.7222	259.1836	239.5690	221.1339	208.8182	205.9218	213.2207	228.7593	248.3740	266.8090 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187 (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)	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495 (71)
Water heating gains (Table 5)	120.9533	118.2742	113.1136	101.8032	94.8753	87.6339	83.1864	86.8611	91.1695	99.2047	110.0469	119.5072 (72)
Total internal gains	625.5064	642.5208	613.2642	591.6411	559.8727	536.4220	514.4330	515.2114	532.0444	553.3924	589.0751	611.7446 (73)

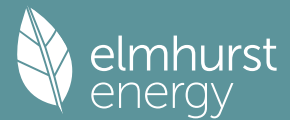
6. Solar gains

[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			
North				3.3800	10.6334	0.6300	0.7000	0.7700	10.9840 (74)			
East				3.1000	19.6403	0.6300	0.7000	0.7700	18.6072 (76)			
South				3.7800	46.7521	0.6300	0.7000	0.7700	54.0088 (78)			
West				3.3900	19.6403	0.6300	0.7000	0.7700	20.3479 (80)			
Solar gains	103.9478	185.6478	273.8393	367.6689	434.1916	439.9519	420.5260	370.1585	306.5445	210.8142	126.1414	87.8601 (83)
Total gains	729.4542	828.1686	887.1035	959.3099	994.0643	976.3739	934.9590	885.3699	838.5889	764.2066	715.2165	699.6047 (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)												
tau	Jan 69.0312	Feb 69.2577	Mar 69.4812	Apr 70.5507	May 70.7544	Jun 71.7186	Jul 71.7186	Aug 71.9001	Sep 71.3441	Oct 70.7544	Nov 70.3434	Dec 69.9189
alpha	5.6021	5.6172	5.6321	5.7034	5.7170	5.7812	5.7812	5.7933	5.7563	5.7170	5.6896	5.6613
util living area												

Full SAP Calculation Printout



	0.9974	0.9941	0.9866	0.9574	0.8747	0.6957	0.5198	0.5686	0.8165	0.9687	0.9940	0.9979 (86)
MIT	19.8445	20.0075	20.2385	20.5630	20.8237	20.9654	20.9945	20.9910	20.9132	20.5805	20.1645	19.8262 (87)
Mth 2	20.0783	20.0811	20.0838	20.0964	20.0988	20.1098	20.1098	20.1119	20.1056	20.0988	20.0940	20.0890 (88)
util rest of house												
	0.9965	0.9922	0.9820	0.9421	0.8318	0.6137	0.4179	0.4643	0.7462	0.9545	0.9917	0.9973 (89)
MIT 2	18.7258	18.9358	19.2311	19.6439	19.9457	20.0894	20.1080	20.1086	20.0453	19.6726	19.1467	18.7103 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.9658	19.1657	19.4472	19.8410	20.1340	20.2773	20.2982	20.2979	20.2314	19.8673	19.3650	18.9497 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9658	19.1657	19.4472	19.8410	20.1340	20.2773	20.2982	20.2979	20.2314	19.8673	19.3650	18.9497 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9950	0.9896	0.9777	0.9368	0.8337	0.6300	0.4398	0.4867	0.7571	0.9498	0.9891	0.9960 (94)
Useful gains	725.8306	819.5155	867.3234	898.6719	828.7937	615.0681	411.2407	430.9153	634.9283	725.8150	707.4044	696.8222 (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	1702.8614	1650.9874	1493.5700	1243.0145	955.4323	634.5009	413.3061	434.5261	688.8479	1049.8334	1397.5376	1690.8615 (97)
Space heating kWh	726.9109	558.7492	465.9274	247.9267	94.2191	0.0000	0.0000	0.0000	0.0000	241.0697	496.8959	739.5652 (98a)
Space heating requirement - total per year (kWh/year)												3571.2641
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	726.9109	558.7492	465.9274	247.9267	94.2191	0.0000	0.0000	0.0000	0.0000	241.0697	496.8959	739.5652 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3571.2641
Space heating per m2										(98c) / (4) =		30.9415 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	726.9109	558.7492	465.9274	247.9267	94.2191	0.0000	0.0000	0.0000	0.0000	241.0697	496.8959	739.5652 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	786.7001	604.7069	504.2505	268.3189	101.9687	0.0000	0.0000	0.0000	0.0000	260.8979	537.7661	800.3953 (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	250.4186	221.3885	235.3056	207.4762	201.4453	181.8982	179.9392	186.9673	188.8580	210.1053	222.7569	247.7915 (64)
Efficiency of water heater (217)m	86.5256	86.2778	85.8160	84.7641	82.8542	80.3000	80.3000	80.3000	80.3000	84.6768	86.0475	86.5731 (217)
Fuel for water heating, kWh/month	289.4156	256.5996	274.1980	244.7688	243.1323	226.5233	224.0837	232.8360	235.1905	248.1262	258.8768	286.2223 (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	32.5742	26.1322	23.5292	17.2385	13.3155	10.8789	12.1468	15.7889	20.5083	26.9079	30.3925	33.4795 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.0728	-72.4292	-102.6890	-113.7765	-121.2168	-112.5468	-111.1025	-105.5899	-95.6623	-82.0010	-56.8790	-45.1318 (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	-32.4260	-67.8664	-134.2908	-200.8601	-264.8253	-265.8769	-262.7941	-222.8828	-163.8356	-96.8236	-43.2107	-25.6714 (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												3865.0045 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3019.9731 (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)												262.8925 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2852.4613 (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												4381.4088 (238)

Full SAP Calculation Printout



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	3865.0045	0.2100	811.6509 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3019.9731	0.2100	634.1944 (264)
Space and water heating			1445.8453 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	262.8925	0.1443	37.9435 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1071.0975	0.1349	-144.4908
PV Unit electricity exported	-1781.3638	0.1260	-224.4766
Total			-368.9674 (269)
Total CO2, kg/year			1126.7506 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7600 (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	3865.0045	1.1300	4367.4551 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3019.9731	1.1300	3412.5696 (278)
Space and water heating			7780.0247 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	262.8925	1.5338	403.2333 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1071.0975	1.4986	-1605.1301
PV Unit electricity exported	-1781.3638	0.4626	-823.9923
Total			-2429.1224 (283)
Total Primary energy kWh/year			5884.2364 (286)
Target Primary Energy Rate (TPER)			50.9800 (287)

Energy Assessment

The Dower House, 393 High Street

eight
versa

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

Be Green Refurbishment - DER from the Be Green scenario DER SAP worksheet

Full SAP Calculation Printout



Property Reference	Proposed HOUSE 1				Issued on Date	07/11/2025	
Assessment Reference	Lean House 1			Prop Type Ref			
Property							
SAP Rating	80 C		DER	4.45		TER	9.60
Environmental	96 A		% DER < TER				53.65
CO ₂ Emissions (t/year)	0.43		DFEE	76.78		TFEE	33.41
Compliance Check	See BREL		% DFEE < TFEE				-129.80
% DPER < TPER	7.59		DPER	46.28		TPER	50.08
Assessor Details	Ms. Vanessa Vienna					Assessor ID	T798-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	54.2600 (1b)	x 2.3000 (2b)	= 124.7980 (1b) - (3b)
First floor	54.2600 (1c)	x 2.3000 (2c)	= 124.7980 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.5960 (5)

2. Ventilation rate

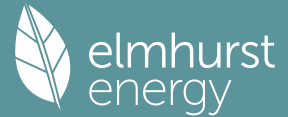
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (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) = 0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491 (22b)
Effective ac	0.8303	0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows upgraded			11.3200	1.8519	20.9630		(27)
Doors new			4.4100	1.4000	6.1740		(26)
Upgraded floor			54.9600	0.2500	13.7400		(28a)
Upgraded wall	12.1400	1.4500	10.6900	0.3000	3.2070		(29a)
New wall	25.0000	2.3900	22.6100	0.1800	4.0698		(29a)
match existing	13.1500	1.4500	11.7000	0.4800	5.6160		(29a)
EXISTING WALL	40.9000	10.4400	30.4600	0.4800	14.6208		(29a)
Upgraded roof	54.9600		54.9600	0.1600	8.7936		(30)
Total net area of external elements Aum(A, m ²)			201.1100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.1842		(33)
Main dwelling							
Party Wall 1			62.0200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							40.2220 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	117.4062 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							

Full SAP Calculation Printout



(38)m	Jan 68.3917	Feb 67.3352	Mar 66.2995	Apr 61.4353	May 60.5252	Jun 56.2886	Jul 56.2886	Aug 55.5041	Sep 57.9205	Oct 60.5252	Nov 62.3663	Dec 64.2911	(38)
Heat transfer coeff	185.7979	184.7413	183.7057	178.8415	177.9314	173.6948	173.6948	172.9102	175.3267	177.9314	179.7725	181.6973	(39)
Average = Sum(39)m / 12 =												178.8371	
HLP	Jan 1.7121	Feb 1.7024	Mar 1.6928	Apr 1.6480	May 1.6396	Jun 1.6006	Jul 1.6006	Aug 1.5933	Sep 1.6156	Oct 1.6396	Nov 1.6566	Dec 1.6743	(40)
HLP (average)												1.6480	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8056	(42)
Hot water usage for mixer showers														
71.2612	70.1903	68.6298	65.6440	63.4405	60.9833	59.5865	61.1353	62.8330	65.4713	68.5213	70.9882	70.9882	(42a)	
Hot water usage for baths														
32.3872	31.9063	31.2289	29.9800	29.0448	28.0079	27.4478	28.1204	28.8527	29.9623	31.2369	32.2778	32.2778	(42b)	
Hot water usage for other uses														
45.6448	43.9850	42.3252	40.6654	39.0056	37.3458	37.3458	39.0056	40.6654	42.3252	43.9850	45.6448	45.6448	(42c)	
Average daily hot water use (litres/day)												137.2239	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
149.2933	146.0816	142.1839	136.2894	131.4910	126.3369	124.3801	128.2613	132.3511	137.7589	143.7432	148.9108	148.9108	(44)	
Energy content (annual)	236.4441	208.0183	218.5314	186.5734	177.0121	155.3460	150.4270	158.8142	163.2022	186.9375	204.7886	233.1583	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2279.2531		
35.4666	31.2027	32.7797	27.9860	26.5518	23.3019	22.5640	23.8221	24.4803	28.0406	30.7183	34.9738	34.9738	(46)	
Water storage loss:														
Store volume												300.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												2.0800	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												1.1232	(55)	
Total storage loss														
34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	(56)	
If cylinder contains dedicated solar storage														
34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	(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														
294.5257	260.4791	276.6130	242.7814	235.0937	211.5540	208.5086	216.8958	219.4102	245.0191	260.9966	291.2399	291.2399	(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	294.5257	260.4791	276.6130	242.7814	235.0937	211.5540	208.5086	216.8958	219.4102	245.0191	260.9966	291.2399	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2963.1171	(64)	
Electric shower(s)												2963	(64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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														
125.0830	111.1347	119.1270	107.0020	105.3218	96.6189	96.4823	99.2710	99.2311	108.6220	113.0586	123.9904	123.9904	(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	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	151.0497	167.2336	151.0497	156.0847	151.0497	156.0847	151.0497	151.0497	156.0847	151.0497	156.0847	151.0497	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	269.4123	272.2079	265.1629	250.1651	231.2329	213.4394	201.5522	198.7565	205.8015	220.7994	239.7315	257.5251	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	(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)	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	(71)
Water heating gains (Table 5)	168.1223	165.3790	160.1169	148.6140	141.5616	134.1930	129.6804	133.4288	137.8210	145.9973	157.0258	166.6538	(72)
Total internal gains	653.6689	669.9052	641.4142	619.9484	588.9289	568.8017	547.3670	548.3197	564.7919	582.9311	617.9267	640.3133	(73)

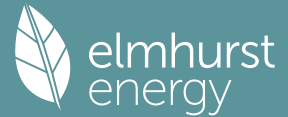
6. Solar gains

[Jan]												Gains
				Area	Solar flux		g		FF	Access		W
				m2	Table 6a		Specific data		Specific data	factor		
					W/m2		or Table 6b		or Table 6c	Table 6d		
North				2.9000		10.6334		0.7600		0.8000	0.7700	12.9929 (74)
East				2.3900		19.6403		0.7600		0.8000	0.7700	19.7780 (76)
West				6.0300		19.6403		0.7600		0.8000	0.7700	49.9001 (80)
Solar gains	82.6710	161.1352	266.6676	395.1555	492.5158	508.4549	482.2702	408.2760	311.8029	191.2945	102.9088	68.1314 (83)
Total gains	736.3399	831.0405	908.0818	1015.1039	1081.4447	1077.2566	1029.6372	956.5957	876.5947	774.2256	720.8356	708.4447 (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	40.5608	40.7928	41.0227	42.1385	42.3540	43.3871	43.3871	43.5839	42.9833	42.3540	41.9203	41.4762	
alpha	3.7041	3.7195	3.7348	3.8092	3.8236	3.8925	3.8925	3.9056	3.8656	3.8236	3.7947	3.7651	
util living area													
	0.9963	0.9937	0.9881	0.9695	0.9218	0.8079	0.6641	0.7171	0.8998	0.9789	0.9936	0.9969	(86)

Full SAP Calculation Printout



Living	19.3245	19.4709	19.7265	20.1176	20.4718	20.7555	20.8656	20.8459	20.6327	20.1761	19.7096	19.3313
Non living	17.6165	17.8084	18.1391	18.6554	19.0885	19.4122	19.4943	19.4903	19.2922	18.7389	18.1380	17.6446
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	20.1429	19.4709	19.7265	20.1176	20.4718	20.7555	20.8656	20.8459	20.6327	20.1761	19.7096	19.5648 (87)
Th 2	19.5322	19.5391	19.5460	19.5783	19.5844	19.6129	19.6129	19.6182	19.6019	19.5844	19.5721	19.5593 (88)
util rest of house												
	0.9949	0.9914	0.9833	0.9557	0.8815	0.7037	0.4896	0.5502	0.8306	0.9668	0.9908	0.9957 (89)
MIT 2	18.7685	17.8084	18.1391	18.6554	19.0885	19.4122	19.4943	19.4903	19.2922	18.7389	18.1380	17.9896 (90)
Living area fraction									FLA = Living area / (4) =			0.2689 (91)
MIT	19.1380	18.2554	18.5659	19.0486	19.4605	19.7734	19.8631	19.8548	19.6527	19.1253	18.5606	18.4131 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1380	18.2554	18.5659	19.0486	19.4605	19.7734	19.8631	19.8548	19.6527	19.1253	18.5606	18.4131 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9945	0.9883	0.9786	0.9487	0.8770	0.7180	0.5249	0.5831	0.8339	0.9611	0.9878	0.9944 (94)
Useful gains	732.2724	821.3583	888.6668	963.0145	948.4170	773.5086	540.4120	557.7745	731.0069	744.0864	712.0667	704.4910 (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	2756.8768	2467.2956	2216.5828	1814.9928	1380.8288	898.5912	566.7770	597.3715	973.5297	1516.9249	2060.2942	2582.4887 (97)
Space heating kWh	1506.3056	1106.0699	987.9695	613.4244	321.7144	0.0000	0.0000	0.0000	0.0000	574.9918	970.7238	1397.2302 (98a)
Space heating requirement - total per year (kWh/year)												7478.4295
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	1506.3056	1106.0699	987.9695	613.4244	321.7144	0.0000	0.0000	0.0000	0.0000	574.9918	970.7238	1397.2302 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7478.4295
Space heating per m2										(98c) / (4) =		68.9129 (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 %)												387.5187 (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	1506.3056	1106.0699	987.9695	613.4244	321.7144	0.0000	0.0000	0.0000	0.0000	574.9918	970.7238	1397.2302 (98)
Space heating efficiency (main heating system 1)	387.5187	387.5187	387.5187	387.5187	387.5187	0.0000	0.0000	0.0000	0.0000	387.5187	387.5187	387.5187 (210)
Space heating fuel (main heating system)	388.7053	285.4236	254.9476	158.2954	83.0191	0.0000	0.0000	0.0000	0.0000	148.3778	250.4973	360.5581 (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	294.5257	260.4791	276.6130	242.7814	235.0937	211.5540	208.5086	216.8958	219.4102	245.0191	260.9966	291.2399 (64)
Efficiency of water heater	281.8113	281.8113	281.8113	281.8113	281.8113	281.8113	281.8113	281.8113	281.8113	281.8113	281.8113	281.8113 (216)
Fuel for water heating, kWh/month	104.5117	92.4303	98.1554	86.1503	83.4224	75.0694	73.9887	76.9649	77.8571	86.9444	92.6139	103.3457 (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	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	31.3851	25.1783	22.6703	16.6092	12.8294	10.4818	11.7035	15.2126	19.7596	25.9257	29.2830	32.2574 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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)	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												1929.8241 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												281.8113
Water heating fuel used												1051.4542 (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)												253.2961 (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												3234.5744 (238)

Full SAP Calculation Printout



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	1929.8241	0.1546	298.4039 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1051.4542	0.1409	148.1675 (264)
Space and water heating			446.5714 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	253.2961	0.1443	36.5585 (268)
Total CO2, kg/year			483.1298 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4500 (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	1929.8241	1.5725	3034.5550 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1051.4542	1.5211	1599.3247 (278)
Space and water heating			4633.8796 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	253.2961	1.5338	388.5140 (282)
Total Primary energy kWh/year			5022.3937 (286)
Dwelling Primary energy Rate (DPER)			46.2800 (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	54.2600 (1b)	x 2.3000 (2b)	= 124.7980 (1b) - (3b)
First floor	54.2600 (1c)	x 2.3000 (2c)	= 124.7980 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	249.5960 (5)

2. Ventilation rate

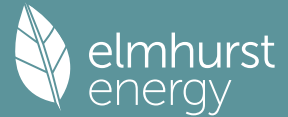
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1603 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4103 (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) = 0.3487 (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 infiltr rate	0.4446	0.4359	0.4272	0.3836	0.3749	0.3313	0.3313	0.3226	0.3487	0.3749	0.3923	0.4097 (22b)
Effective ac	0.5988	0.5950	0.5912	0.5736	0.5703	0.5549	0.5549	0.5520	0.5608	0.5703	0.5770	0.5839 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			4.4100	1.0000	4.4100		(26)
TER Opening Type			11.3200	1.1450	12.9618		(27)
Upgraded floor			54.9600	0.1300	7.1448		(28a)
Upgraded wall	12.1400	1.4500	10.6900	0.1800	1.9242		(29a)
New wall	25.0000	2.3900	22.6100	0.1800	4.0698		(29a)
match existing	13.1500	1.4500	11.7000	0.1800	2.1060		(29a)
EXISTING WALL	40.9000	10.4400	30.4600	0.1800	5.4828		(29a)
Upgraded roof	54.9600		54.9600	0.1100	6.0456		(30)
Total net area of external elements Aum(A, m2)			201.1100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.1450		(33)

Full SAP Calculation Printout



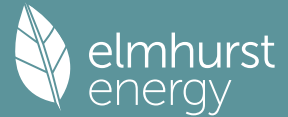
Main dwelling													
Party Wall 1						62.0200	0.0000	0.0000					(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)												10.0555	(36)
Point Thermal bridges												0.0000	(36a) =
Total fabric heat loss												54.2005	(33) + (36) + (36a) = (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	49.3247	49.0085	48.6987	47.2432	46.9709	45.7032	45.7032	45.4684	46.1915	46.9709	47.5218	48.0977	(38)
Average = Sum(39)m / 12 =	103.5252	103.2091	102.8992	101.4437	101.1714	99.9037	99.9037	99.6690	100.3920	101.1714	101.7223	102.2982	(39)
												101.4424	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9540	0.9511	0.9482	0.9348	0.9323	0.9206	0.9206	0.9184	0.9251	0.9323	0.9374	0.9427	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.8056 (42)
Hot water usage for mixer showers													
	71.2612	70.1903	68.6298	65.6440	63.4405	60.9833	59.5865	61.1353	62.8330	65.4713	68.5213	70.9882	(42a)
Hot water usage for baths													
	30.7679	30.3109	29.6675	28.4810	27.5926	26.6075	26.0754	26.7144	27.4101	28.4642	29.6751	30.6639	(42b)
Hot water usage for other uses													
	43.3626	41.7858	40.2090	38.6321	37.0553	35.4785	35.4785	37.0553	38.6321	40.2090	41.7858	43.3626	(42c)
Average daily hot water use (litres/day)													133.6477 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	145.3917	142.2870	138.5062	132.7571	128.0884	123.0693	121.1404	124.9050	128.8752	134.1445	139.9821	145.0147	(44)
Energy content (annual)	230.2650	202.6148	212.8789	181.7379	172.4317	151.3280	146.5089	154.6584	158.9160	182.0328	199.4302	227.0579	(45)
Distribution loss (46)m = 0.15 x (45)m													
	34.5397	30.3922	31.9318	27.2607	25.8648	22.6992	21.9763	23.1988	23.8374	27.3049	29.9145	34.0587	(46)
Water storage loss:													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.1127 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1409 (55)
Total storage loss													
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage													
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
WWHRS	288.8938	255.5699	271.5077	238.4754	231.0605	208.0656	205.1377	213.2873	215.6536	240.6616	256.1678	285.6868	(62)
PV diverter	-32.5777	-28.8120	-30.1702	-24.9821	-23.2824	-19.9230	-18.6746	-19.8586	-20.6131	-24.3005	-27.5295	-31.9744	(63a)
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	(63b)
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	(63c)
Output from w/h													
	256.3161	226.7580	241.3375	213.4933	207.7780	188.1426	186.4631	193.4287	195.0405	216.3611	228.6382	253.7124	(64)
12Total per year (kWh/year)													2607.4695 (64)
Electric shower(s)													2607 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
	123.4661	109.7335	117.6853	105.8179	104.2366	95.7066	95.6173	98.3270	98.2296	107.4290	111.7006	122.3998	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	140.2822	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.5137	172.1759	155.5137	160.6975	155.5137	160.6975	155.5137	155.5137	160.6975	155.5137	160.6975	155.5137	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	269.4123	272.2079	265.1629	250.1651	231.2329	213.4394	201.5522	198.7565	205.8015	220.7994	239.7315	257.5251	(68)
Pumps, fans	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	37.0282	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	-112.2258	(71)
Total internal gains	165.9491	163.2939	158.1791	146.9693	140.1029	132.9259	128.5178	132.1599	136.4300	144.3938	155.1397	164.5159	(72)
	658.9597	675.7623	646.9404	625.9165	594.9342	572.1473	550.6683	551.5148	568.0137	588.7915	623.6534	645.6393	(73)

6. Solar gains													
[Jan]													
	Area												
	m2												
	Solar flux												
	Table 6a												
	W/m2												
	Specific data												
	or Table 6b												
	Specific data												
	or Table 6c												
	Access												
	factor												
	Table 6d												
	Gains												
	W												
North	2.9000												9.4241 (74)
East	2.3900												14.3455 (76)
West	6.0300												36.1940 (80)
Solar gains	59.9637	116.8761	193.4217	286.6177	357.2360	368.7971	349.8046	296.1344	226.1596	138.7515	74.6427	49.4177	(83)
Total gains	718.9234	792.6384	840.3621	912.5342	952.1702	940.9444	900.4729	847.6492	794.1733	727.5429	698.2961	695.0570	(84)

Full SAP Calculation Printout



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	72.7949	73.0179	73.2378	74.2886	74.4886	75.4337	75.4337	75.6114	75.0668	74.4886	74.0852	73.6681	
alpha	5.8530	5.8679	5.8825	5.9526	5.9659	6.0289	6.0289	6.0408	6.0045	5.9659	5.9390	5.9112	
util living area	0.9966	0.9932	0.9848	0.9497	0.8513	0.6568	0.4848	0.5347	0.7926	0.9630	0.9923	0.9972 (86)	
MIT	19.9629	20.1037	20.3186	20.6290	20.8660	20.9780	20.9969	20.9946	20.9349	20.6384	20.2591	19.9472 (87)	
Th 2	20.1219	20.1243	20.1267	20.1380	20.1401	20.1500	20.1500	20.1519	20.1462	20.1401	20.1359	20.1314 (88)	
util rest of house	0.9955	0.9910	0.9797	0.9326	0.8059	0.5790	0.3930	0.4394	0.7220	0.9470	0.9894	0.9963 (89)	
MIT 2	18.9095	19.0908	19.3650	19.7568	20.0259	20.1373	20.1490	20.1499	20.1018	19.7756	19.2983	18.8967 (90)	
Living area fraction									fLA = Living area / (4) =				0.2689 (91)
MIT	19.1928	19.3632	19.6214	19.9913	20.2518	20.3633	20.3770	20.3770	20.3258	20.0076	19.5567	19.1792 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.1928	19.3632	19.6214	19.9913	20.2518	20.3633	20.3770	20.3770	20.3258	20.0076	19.5567	19.1792 (93)	

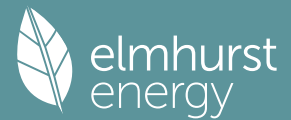
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9938	0.9884	0.9759	0.9292	0.8124	0.5992	0.4178	0.4651	0.7381	0.9439	0.9867	0.9949 (94)
Useful gains	714.4874	783.4595	820.0819	847.8998	773.5362	563.8357	376.1749	394.2361	586.1643	686.7562	689.0423	691.4936 (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	1541.7761	1492.7328	1350.1792	1125.1440	865.1985	575.7796	377.3349	396.3857	625.0223	951.7788	1267.1200	1532.3434 (97)
Space heating kWh	615.5028	476.6317	394.3924	199.6158	68.1968	0.0000	0.0000	0.0000	0.0000	197.1768	416.2160	625.5922 (98a)
Space heating requirement - total per year (kWh/year)												2993.3245
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	615.5028	476.6317	394.3924	199.6158	68.1968	0.0000	0.0000	0.0000	0.0000	197.1768	416.2160	625.5922 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2993.3245
Space heating per m2										(98c) / (4) =		27.5832 (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	615.5028	476.6317	394.3924	199.6158	68.1968	0.0000	0.0000	0.0000	0.0000	197.1768	416.2160	625.5922 (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)	666.8503	516.3940	427.2940	216.2685	73.8860	0.0000	0.0000	0.0000	0.0000	213.6261	450.9382	677.7813 (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	256.3161	226.7580	241.3375	213.4933	207.7780	188.1426	186.4631	193.4287	195.0405	216.3611	228.6382	253.7124 (64)	
Efficiency of water heater (217)m	85.9501	85.6846	85.1542	83.9093	81.8499	79.8000	79.8000	79.8000	79.8000	83.8521	85.3856	79.8000 (216)	
Fuel for water heating, kWh/month	298.2152	264.6425	283.4124	254.4334	253.8524	235.7677	233.6630	242.3919	244.4117	258.0269	267.7713	295.0097 (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	32.3127	25.9224	23.3403	17.1001	13.2086	10.7915	12.0493	15.6622	20.3436	26.6919	30.1484	33.2107 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-49.3329	-68.8030	-97.8035	-108.6559	-116.0079	-107.8072	-106.4437	-101.0601	-91.3758	-78.0607	-53.9610	-42.7368 (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	-30.1144	-63.1055	-125.0093	-187.1712	-246.9560	-247.9936	-245.1007	-207.7759	-152.6089	-90.0734	-40.1451	-23.8337 (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													3243.0384 (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													3131.5981 (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)													260.7818 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2681.9364 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)

Full SAP Calculation Printout



Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4039.4819 (238)

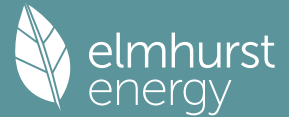
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3243.0384	0.2100	681.0381 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3131.5981	0.2100	657.6356 (264)
Space and water heating			1338.6737 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	260.7818	0.1443	37.6389 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.0486	0.1348	-137.8137
PV Unit electricity exported	-1659.8878	0.1260	-209.1202
Total			-346.9339 (269)
Total CO2, kg/year			1041.3079 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6000 (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	3243.0384	1.1300	3664.6334 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3131.5981	1.1300	3538.7058 (278)
Space and water heating			7203.3393 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	260.7818	1.5338	399.9958 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.0486	1.4984	-1531.3994
PV Unit electricity exported	-1659.8878	0.4625	-767.6211
Total			-2299.0205 (283)
Total Primary energy kWh/year			5434.4154 (286)
Target Primary Energy Rate (TPER)			50.0800 (287)

Full SAP Calculation Printout



Property Reference	Proposed HOUSE 2				Issued on Date	07/11/2025
Assessment Reference	House 2	Prop Type Ref				
Property						
SAP Rating	79 C	DER	4.54	TER	9.63	
Environmental	96 A	% DER < TER				52.86
CO ₂ Emissions (t/year)	0.46	DFEE	81.55	TFEE	35.01	
Compliance Check	See BREL	% DFEE < TFEE				-132.90
% DPER < TPER	6.34	DPER	47.07	TPER	50.26	
Assessor Details	Ms. Vanessa Vienna				Assessor ID	T798-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	57.7100 (1b)	x 2.3000 (2b)	= 132.7330 (1b) - (3b)
First floor	57.7100 (1c)	x 2.3000 (2c)	= 132.7330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.4660 (5)

2. Ventilation rate

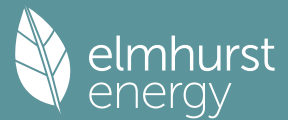
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (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	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Effective ac	0.8912	0.8760	0.8611	0.7912	0.7781	0.7172	0.7172	0.7059	0.7406	0.7781	0.8046	0.8322 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows upgraded			12.3900	1.8519	22.9444		(27)
Doors new			2.2600	1.4000	3.1640		(26)
new window			1.2600	1.3258	1.6705		(27)
Upgraded floor			57.7100	0.2500	14.4275		(28a)
Upgraded wall	26.7000	3.2400	23.4600	0.3000	7.0380		(29a)
New wall	32.6700	2.8100	29.8600	0.1800	5.3748		(29a)
match existing	34.1500		34.1500	0.4800	16.3920		(29a)
EXISTING WALL	27.7000	9.8600	17.8400	0.4800	8.5632		(29a)
Upgraded roof	57.7100		57.7100	0.1600	9.2336		(30)
Total net area of external elements Aum(A, m ²)			236.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.8080		(33)
Main dwelling							
Party Wall 1			82.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							47.3280 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	136.1360 (37)

Full SAP Calculation Printout



Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 78.0723	Feb 76.7415	Mar 75.4371	Apr 69.3103	May 68.1640	Jun 62.8278	Jul 62.8278	Aug 61.8396	Sep 64.8833	Oct 68.1640	Nov 70.4830	Dec 72.9074 (38)
Heat transfer coeff	214.2083	212.8775	211.5731	205.4463	204.3000	198.9638	198.9638	197.9756	201.0193	204.3000	206.6190	209.0434 (39)
Average = Sum(39)m / 12 =												205.4409
HLP	Jan 1.8559	Feb 1.8444	Mar 1.8331	Apr 1.7800	May 1.7701	Jun 1.7238	Jul 1.7238	Aug 1.7153	Sep 1.7416	Oct 1.7701	Nov 1.7901	Dec 1.8112 (40)
HLP (average)												1.7799
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

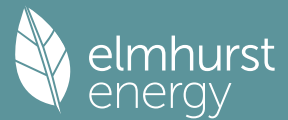
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.8437 (42)
Hot water usage for mixer showers												
	71.8999	70.8194	69.2449	66.2323	64.0091	61.5298	60.1206	61.6832	63.3961	66.0581	69.1354	71.6245 (42a)
Hot water usage for baths												
	32.6764	32.1911	31.5077	30.2476	29.3041	28.2579	27.6928	28.3714	29.1103	30.2298	31.5158	32.5659 (42b)
Hot water usage for other uses												
	46.0555	44.3807	42.7060	41.0313	39.3565	37.6818	37.6818	39.3565	41.0313	42.7060	44.3807	46.0555 (42c)
Average daily hot water use (litres/day)												138.4541 (43)
Daily hot water use	Jan 150.6318	Feb 147.3912	Mar 143.4586	Apr 137.5112	May 132.6698	Jun 127.4695	Jul 125.4952	Aug 129.4112	Sep 133.5377	Oct 138.9939	Nov 145.0319	Dec 150.2458 (44)
Energy conte	238.5639	209.8832	220.4905	188.2460	178.5990	156.7387	151.7756	160.2380	164.6653	188.6134	206.6246	235.2487 (45)
Energy content (annual)										Total = Sum(45)m =		2299.6868
Distribution loss (46)m = 0.15 x (45)m												
	35.7846	31.4825	33.0736	28.2369	26.7899	23.5108	22.7663	24.0357	24.6998	28.2920	30.9937	35.2873 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0800 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1232 (55)
Total storage loss												
	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192 (56)
If cylinder contains dedicated solar storage												
	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192 (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												
	296.6455	262.3440	278.5721	244.4540	236.6806	212.9467	209.8572	218.3196	220.8733	246.6950	262.8326	293.3303 (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												
	296.6455	262.3440	278.5721	244.4540	236.6806	212.9467	209.8572	218.3196	220.8733	246.6950	262.8326	293.3303 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2983.5508 (64)
Electric shower(s)												2984 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	125.7878	111.7548	119.7784	107.5582	105.8494	97.0820	96.9307	99.7444	99.7176	109.1792	113.6691	124.6855 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan 142.1869	Feb 142.1869	Mar 142.1869	Apr 142.1869	May 142.1869	Jun 142.1869	Jul 142.1869	Aug 142.1869	Sep 142.1869	Oct 142.1869	Nov 142.1869	Dec 142.1869 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	152.5951	168.9445	152.5951	157.6816	152.5951	157.6816	152.5951	152.5951	157.6816	152.5951	157.6816	152.5951 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	279.1247	282.0211	274.7222	259.1836	239.5690	221.1339	208.8182	205.9218	213.2207	228.7593	248.3740	266.8090 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187	37.2187 (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)												
	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495 (71)
Water heating gains (Table 5)												
	169.0696	166.3018	160.9924	149.3864	142.2708	134.8361	130.2831	134.0651	138.4967	146.7463	157.8737	167.5880 (72)
Total internal gains												
	666.4454	682.9235	653.9657	631.9076	600.0909	579.3077	557.3525	558.2380	575.0550	593.7567	629.5853	652.6481 (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
North		3.3800		10.6334		0.7600		0.8000		0.7700		15.1435 (74)
East		3.1000		19.6403		0.7600		0.7700		0.7700		25.6535 (76)
South		2.5200		46.7521		0.7600		0.8000		0.7700		49.6407 (78)
West		3.3900		19.6403		0.7600		0.8000		0.7700		28.0533 (80)
South		1.2600		46.7521		0.7600		0.7000		0.7700		21.7178 (78)
Solar gains	140.2088	250.8686	371.0655	499.5841	590.9903	599.2188	572.6050	503.3710	415.8669	285.1658	170.2316	118.4505 (83)
Total gains	806.6542	933.7921	1025.0313	1131.4918	1191.0811	1178.5265	1129.9575	1061.6090	990.9220	878.9225	799.8169	771.0986 (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)												
tau	Jan 37.4181	Feb 37.6521	Mar 37.8842	Apr 39.0140	May 39.2329	Jun 40.2851	Jul 40.2851	Aug 40.4862	Sep 39.8732	Oct 39.2329	Nov 38.7925	Dec 38.3427

Full SAP Calculation Printout



alpha	3.4945	3.5101	3.5256	3.6009	3.6155	3.6857	3.6857	3.6991	3.6582	3.6155	3.5862	3.5562
util living area	0.9957	0.9924	0.9859	0.9671	0.9220	0.8159	0.6771	0.7232	0.8945	0.9755	0.9926	0.9964 (86)
Living	19.1997	19.3659	19.6382	20.0448	20.4129	20.7197	20.8468	20.8264	20.6009	20.1215	19.6177	19.2077
Non living	17.3861	17.6039	17.9560	18.4944	18.9455	19.2996	19.3958	19.3920	19.1812	18.6013	17.9529	17.4180
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	20.0790	19.3659	19.6382	20.0448	20.4129	20.7197	20.8468	20.8264	20.6009	20.1215	19.6177	19.4584 (87)
Th 2	19.4311	19.4391	19.4469	19.4840	19.4910	19.5238	19.5238	19.5299	19.5111	19.4910	19.4769	19.4622 (88)
util rest of house	0.9942	0.9895	0.9802	0.9520	0.8804	0.7087	0.4922	0.5477	0.8203	0.9612	0.9893	0.9951 (89)
MIT 2	18.6159	17.6039	17.9560	18.4944	18.9455	19.2996	19.3958	19.3920	19.1812	18.6013	17.9529	17.7863 (90)
Living area fraction									fLA = Living area /	(4) =		0.2145 (91)
MIT	18.9297	17.9819	18.3169	18.8270	19.2603	19.6043	19.7070	19.6997	19.4858	18.9275	18.3101	18.1450 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9297	17.9819	18.3169	18.8270	19.2603	19.6043	19.7070	19.6997	19.4858	18.9275	18.3101	18.1450 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9935	0.9855	0.9741	0.9428	0.8720	0.7159	0.5186	0.5716	0.8186	0.9534	0.9854	0.9935 (94)
Useful gains	801.4208	920.2935	998.4771	1066.8163	1038.6135	843.7252	585.9611	606.8166	811.2151	837.9677	788.1677	766.0770 (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	3133.8121	2784.8337	2500.1377	2039.4645	1544.5665	995.6674	618.1885	653.2527	1082.6467	1701.3007	2316.2128	2915.1154 (97)
Space heating kWh	1735.2991	1252.9710	1117.2355	700.3067	376.4291	0.0000	0.0000	0.0000	0.0000	642.3198	1100.1925	1598.8846 (98a)
Space heating requirement - total per year (kWh/year)												8523.6382
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	1735.2991	1252.9710	1117.2355	700.3067	376.4291	0.0000	0.0000	0.0000	0.0000	642.3198	1100.1925	1598.8846 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8523.6382
Space heating per m2										(98c) / (4) =		73.8489 (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 %)												390.6604 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1735.2991	1252.9710	1117.2355	700.3067	376.4291	0.0000	0.0000	0.0000	0.0000	642.3198	1100.1925	1598.8846 (98)
Space heating efficiency (main heating system 1)	390.6604	390.6604	390.6604	390.6604	390.6604	0.0000	0.0000	0.0000	0.0000	390.6604	390.6604	390.6604 (210)
Space heating fuel (main heating system)	444.1963	320.7315	285.9863	179.2622	96.3571	0.0000	0.0000	0.0000	0.0000	164.4189	281.6237	409.2773 (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	296.6455	262.3440	278.5721	244.4540	236.6806	212.9467	209.8572	218.3196	220.8733	246.6950	262.8326	293.3303 (64)
Efficiency of water heater (217)m	281.9414	281.9414	281.9414	281.9414	281.9414	281.9414	281.9414	281.9414	281.9414	281.9414	281.9414	281.9414 (216)
Fuel for water heating, kWh/month	105.2153	93.0491	98.8050	86.7038	83.9468	75.5287	74.4329	77.4344	78.3402	87.4987	93.2224	104.0395 (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	31.7062	25.4359	22.9022	16.7792	12.9607	10.5890	11.8232	15.3682	19.9618	26.1910	29.5826	32.5875 (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												2181.8534 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												281.9414
Water heating fuel used												1058.2168 (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)												255.8875 (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												

Full SAP Calculation Printout



Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3495.9578 (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	2181.8534	0.1547	337.4289 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1058.2168	0.1409	149.1252 (264)
Space and water heating			486.5542 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	255.8875	0.1443	36.9325 (268)
Total CO2, kg/year			523.4867 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5400 (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	2181.8534	1.5725	3431.0451 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1058.2168	1.5211	1609.6290 (278)
Space and water heating			5040.6742 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	255.8875	1.5338	392.4888 (282)
Total Primary energy kWh/year			5433.1630 (286)
Dwelling Primary energy Rate (DPER)			47.0700 (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	57.7100 (1b)	x 2.3000 (2b)	= 132.7330 (1b) - (3b)
First floor	57.7100 (1c)	x 2.3000 (2c)	= 132.7330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 265.4660 (5)

2. Ventilation rate

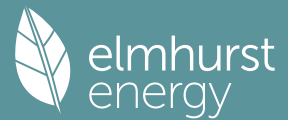
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	40.0000 / (5) = 0.1507 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4007 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3706 (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	0.4726	0.4633	0.4540	0.4077	0.3984	0.3521	0.3521	0.3428	0.3706	0.3984	0.4170	0.4355 (22b)
Effective ac	0.6117	0.6073	0.6031	0.5831	0.5794	0.5620	0.5620	0.5588	0.5687	0.5794	0.5869	0.5948 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type			13.6500	1.1450	15.6298		(27)
Upgraded floor			57.7100	0.1300	7.5023		(28a)
Upgraded wall	26.7000	3.2400	23.4600	0.1800	4.2228		(29a)
New wall	32.6700	2.8100	29.8600	0.1800	5.3748		(29a)
match existing	34.1500		34.1500	0.1800	6.1470		(29a)
EXISTING WALL	27.7000	9.8600	17.8400	0.1800	3.2112		(29a)

Full SAP Calculation Printout



Upgraded roof	57.7100	57.7100	0.1100	6.3481	(30)
Total net area of external elements Aum(A, m2)		236.6400			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		50.6960	(33)
Main dwelling					
Party Wall 1	82.5000	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)					11.8320 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =	62.5280 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	53.5830	53.2032	52.8309	51.0823	50.7551	49.2321	49.2321	48.9500	49.8187	50.7551	51.4169	52.1089	(38)
Average = Sum(39)m / 12 =	116.1110	115.7312	115.3589	113.6102	113.2831	111.7601	111.7601	111.4780	112.3467	113.2831	113.9449	114.6369	(39)
												113.6087	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0060	1.0027	0.9995	0.9843	0.9815	0.9683	0.9683	0.9658	0.9734	0.9815	0.9872	0.9932	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8437 (42)
Hot water usage for mixer showers	71.8999	70.8194	69.2449	66.2323	64.0091	61.5298	60.1206	61.6832	63.3961	66.0581	69.1354	71.6245	(42a)
Hot water usage for baths	31.0425	30.5815	29.9323	28.7353	27.8389	26.8450	26.3082	26.9529	27.6548	28.7183	29.9400	30.9376	(42b)
Hot water usage for other uses	43.7527	42.1617	40.5707	38.9797	37.3887	35.7977	35.7977	37.3887	38.9797	40.5707	42.1617	43.7527	(42c)
Average daily hot water use (litres/day)													134.8459 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	146.6952	143.5626	139.7479	133.9473	129.2367	124.1725	122.2265	126.0248	130.0306	135.3471	141.2371	146.3148	(44)
Energy content (annual)	232.3293	204.4313	214.7873	183.3671	173.9775	152.6846	147.8223	156.0450	160.3407	183.6648	201.2181	229.0936	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2239.7617	
Water storage loss:	34.8494	30.6647	32.2181	27.5051	26.0966	22.9027	22.1733	23.4067	24.0511	27.5497	30.1827	34.3640	(46)
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.1127 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1409 (55)
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	290.9581	257.3864	273.4161	240.1047	232.6063	209.4222	206.4511	214.6738	217.0783	242.2936	257.9557	287.7224	(62)
WWHRS	-32.8696	-29.0702	-30.4406	-25.2060	-23.4911	-20.1015	-18.8420	-20.0365	-20.7978	-24.5183	-27.7763	-32.2610	(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	258.0885	228.3162	242.9755	214.8986	209.1152	189.3207	187.6092	194.6372	196.2805	217.7753	230.1794	255.4614	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2624.6577	(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	124.1526	110.3375	118.3198	106.3596	104.7506	96.1577	96.0540	98.7880	98.7033	107.9716	112.2951	123.0767	(65)

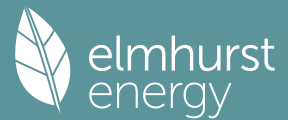
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	142.1869	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.7724	173.5694	156.7724	161.9981	156.7724	161.9981	156.7724	156.7724	161.9981	156.7724	161.9981	156.7724	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	279.1247	282.0211	274.7222	259.1836	239.5690	221.1339	208.8182	205.9218	213.2207	228.7593	248.3740	266.8090	(68)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	-113.7495	(71)
Water heating gains (Table 5)	166.8717	164.1926	159.0320	147.7217	140.7938	133.5523	129.1048	132.7796	137.0880	145.1231	155.9654	165.4256	(72)
Total internal gains	671.4248	688.4392	659.1827	637.5595	605.7912	582.3405	560.3515	561.1298	577.9629	599.3108	634.9935	657.6630	(73)

6. Solar gains

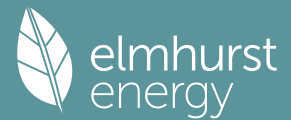
[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.3800	10.6334		0.6300		0.7000		0.7700		10.9840 (74)
East				3.1000	19.6403		0.6300		0.7000		0.7700		18.6072 (76)
South				3.7800	46.7521		0.6300		0.7000		0.7700		54.0088 (78)
West				3.3900	19.6403		0.6300		0.7000		0.7700		20.3479 (80)
Solar gains	103.9478	185.6478	273.8393	367.6689	434.1916	439.9519	420.5260	370.1585	306.5445	210.8142	126.1414	87.8601	(83)
Total gains	775.3727	874.0871	933.0219	1005.2284	1039.9827	1022.2924	980.8775	931.2883	884.5074	810.1250	761.1349	745.5231	(84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.0312	69.2577	69.4812	70.5507	70.7544	71.7186	71.7186	71.9001	71.3441	70.7544	70.3434	69.9189
alpha	5.6021	5.6172	5.6321	5.7034	5.7170	5.7812	5.7812	5.7933	5.7563	5.7170	5.6896	5.6613
util living area	0.9965	0.9924	0.9831	0.9486	0.8566	0.6704	0.4967	0.5427	0.7905	0.9601	0.9919	0.9972 (86)
MIT	19.8875	20.0496	20.2786	20.5967	20.8441	20.9713	20.9956	20.9929	20.9271	20.6164	20.2067	19.8695 (87)
Th 2	20.0783	20.0811	20.0838	20.0964	20.0988	20.1098	20.1098	20.1119	20.1056	20.0988	20.0940	20.0890 (88)
util rest of house	0.9953	0.9899	0.9775	0.9310	0.8108	0.5891	0.3987	0.4421	0.7174	0.9427	0.9888	0.9962 (89)
MIT 2	18.7807	18.9892	19.2811	19.6833	19.9657	20.0932	20.1084	20.1093	20.0562	19.7148	19.1999	18.7656 (90)
Living area fraction	fLA = Living area / (4) = 0.2145 (91)											
MIT	19.0181	19.2167	19.4951	19.8792	20.1541	20.2816	20.2987	20.2989	20.2430	19.9082	19.4159	19.0024 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.0181	19.2167	19.4951	19.8792	20.1541	20.2816	20.2987	20.2989	20.2430	19.9082	19.4159	19.0024 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9934	0.9868	0.9727	0.9259	0.8139	0.6055	0.4198	0.4637	0.7297	0.9381	0.9857	0.9947 (94)
Useful gains	770.2844	862.5482	907.5424	930.7025	846.4491	619.0093	411.7456	431.8164	645.4280	759.9963	750.2314	741.5347 (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	1708.9347	1656.8845	1499.1027	1247.3545	957.7096	634.9722	413.3687	434.6361	690.1460	1054.4604	1403.3343	1696.8989 (97)
Space heating kWh	698.3559	533.7940	440.1208	227.9894	82.7778	0.0000	0.0000	0.0000	0.0000	219.0813	470.2341	710.7910 (98a)
Space heating requirement - total per year (kWh/year)												3383.1443
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	698.3559	533.7940	440.1208	227.9894	82.7778	0.0000	0.0000	0.0000	0.0000	219.0813	470.2341	710.7910 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3383.1443
Space heating per m2											(98c) / (4) =	29.3116 (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	698.3559	533.7940	440.1208	227.9894	82.7778	0.0000	0.0000	0.0000	0.0000	219.0813	470.2341	710.7910 (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)	756.6152	578.3250	476.8373	247.0091	89.6835	0.0000	0.0000	0.0000	0.0000	237.3578	509.4627	770.0877 (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	258.0885	228.3162	242.9755	214.8986	209.1152	189.3207	187.6092	194.6372	196.2805	217.7753	230.1794	255.4614 (64)
Efficiency of water heater	86.1773	85.8977	85.3751	84.1926	82.1615	79.8000	79.8000	79.8000	79.8000	84.0732	85.6264	79.8000 (216)
Fuel for water heating, kWh/month	299.4853	265.8000	284.5977	255.2464	254.5172	237.2439	235.0992	243.9063	245.9655	259.0305	268.8184	296.2598 (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	32.5742	26.1322	23.5292	17.2385	13.3155	10.8789	12.1468	15.7889	20.5083	26.9079	30.3925	33.4795 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-52.0728	-72.4292	-102.6890	-113.7765	-121.2168	-112.5468	-111.1025	-105.5899	-95.6623	-82.0010	-56.8790	-45.1318 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-32.4260	-67.8664	-134.2908	-200.8601	-264.8253	-265.8769	-262.7941	-222.8828	-163.8356	-96.8236	-43.2107	-25.6714 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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												3665.3784 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												3145.9705 (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)												262.8925 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												

Full SAP Calculation Printout



PV generation	-2852.4613 (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	4307.7801 (238)

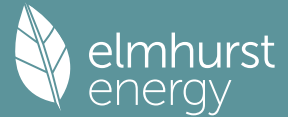
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3665.3784	0.2100	769.7295 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3145.9705	0.2100	660.6538 (264)
Space and water heating			1430.3833 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	262.8925	0.1443	37.9435 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1071.0975	0.1349	-144.4908
PV Unit electricity exported	-1781.3638	0.1260	-224.4766
Total			-368.9674 (269)
Total CO2, kg/year			1111.2886 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3665.3784	1.1300	4141.8776 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3145.9705	1.1300	3554.9466 (278)
Space and water heating			7696.8242 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	262.8925	1.5338	403.2333 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1071.0975	1.4986	-1605.1301
PV Unit electricity exported	-1781.3638	0.4626	-823.9923
Total			-2429.1224 (283)
Total Primary energy kWh/year			5801.0360 (286)
Target Primary Energy Rate (TPER)			50.2600 (287)

Full SAP Calculation Printout



Property Reference	Proposed HOUSE 3				Issued on Date	07/11/2025
Assessment Reference	House 3	Prop Type Ref				
Property						
SAP Rating	74 C	DER	6.46	TER	14.57	
Environmental	94 A	% DER < TER				55.66
CO ₂ Emissions (t/year)	0.48	DFEE	119.61	TFEE	50.64	
Compliance Check	See BREL	% DFEE < TFEE				-136.19
% DPER < TPER	12.44	DPER	67.00	TPER	76.52	
Assessor Details	Ms. Vanessa Vienna				Assessor ID	T798-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.2700 (1b)	x 2.3000 (2b)	= 94.9210 (1b) - (3b)
First floor	41.2700 (1c)	x 2.3000 (2c)	= 94.9210 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 189.8420 (5)

2. Ventilation rate

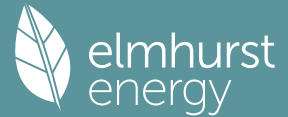
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (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	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Effective ac	0.8912	0.8760	0.8611	0.7912	0.7781	0.7172	0.7172	0.7059	0.7406	0.7781	0.8046	0.8322 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows upgraded			15.1700	1.8519	28.0926		(27)
Doors new			4.7300	1.4000	6.6220		(26)
Upgraded floor			41.2700	0.2500	10.3175		(28a)
Heatloss Floor 2			41.2700	0.2500	10.3175		(28a)
Upgraded wall	6.4300		6.4300	0.3000	1.9290		(29a)
New wall	7.4500	3.7300	3.7200	0.1800	0.6696		(29a)
match existing	13.1500		13.1500	0.4800	6.3120		(29a)
EXISTING WALL	126.0000	16.1700	109.8300	0.4800	52.7184		(29a)
Upgraded roof	41.2700		41.2700	0.1600	6.6032		(30)
Total net area of external elements Aum(A, m ²)			276.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	123.5818		(33)
Main dwelling							
Party Wall 1			21.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							55.3680 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	178.9498 (37)

Full SAP Calculation Printout



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	55.8316	54.8800	53.9471	49.5657	48.7460	44.9299	44.9299	44.2232	46.3998	48.7460	50.4043	52.1380	(38)
Heat transfer coeff	234.7814	233.8298	232.8969	228.5155	227.6958	223.8797	223.8797	223.1730	225.3496	227.6958	229.3541	231.0878	(39)
Average = Sum(39)m / 12 =												228.5116	
HLP	2.8445	2.8329	2.8216	2.7685	2.7586	2.7124	2.7124	2.7038	2.7302	2.7586	2.7787	2.7997	(40)
HLP (average)												2.7685	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5093 (42)
Hot water usage for mixer showers	66.2923	65.2960	63.8443	61.0667	59.0169	56.7310	55.4316	56.8724	58.4517	60.9061	63.7434	66.0383	(42a)
Hot water usage for baths	30.1380	29.6904	29.0601	27.8979	27.0277	26.0628	25.5416	26.1675	26.8489	27.8814	29.0675	30.0361	(42b)
Hot water usage for other uses	42.4502	40.9065	39.3629	37.8192	36.2756	34.7319	34.7319	36.2756	37.8192	39.3629	40.9065	42.4502	(42c)
Average daily hot water use (litres/day)												127.6530	(43)
Daily hot water use	138.8804	135.8929	132.2673	126.7838	122.3202	117.5257	115.7052	119.3154	123.1199	128.1504	133.7174	138.5245	(44)
Energy conte	219.9526	193.5097	203.2898	173.5607	164.6665	144.5115	139.9354	147.7374	151.8191	173.8989	190.5050	216.8959	(45)
Energy content (annual)										Total = Sum(45)m =		2120.2826	
Distribution loss (46)m = 0.15 x (45)m	32.9929	29.0265	30.4935	26.0341	24.7000	21.6767	20.9903	22.1606	22.7729	26.0848	28.5757	32.5344	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1232	(55)
Total storage loss	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	(56)
If cylinder contains dedicated solar storage	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	(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	278.0342	245.9705	261.3714	229.7687	222.7481	200.7195	198.0170	205.8190	208.0271	231.9805	246.7130	274.9775	(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	278.0342	245.9705	261.3714	229.7687	222.7481	200.7195	198.0170	205.8190	208.0271	231.9805	246.7130	274.9775	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2804.1466	(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	119.5995	106.3106	114.0592	102.6753	101.2169	93.0165	92.9938	95.5880	95.4463	104.2867	108.3093	118.5832	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.6278	125.8022	113.6278	117.4154	113.6278	117.4154	113.6278	113.6278	117.4154	113.6278	117.4154	113.6278	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.6671	226.9984	221.1235	208.6165	192.8287	177.9904	168.0775	165.7462	171.6211	184.1280	199.9159	214.7542	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	(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)	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	(71)
Water heating gains (Table 5)	160.7520	158.2003	153.3053	142.6046	136.0442	129.1896	124.9916	128.4785	132.5642	140.1702	150.4296	159.3860	(72)
Total internal gains	559.6863	571.6403	548.6960	529.2760	503.1401	485.2347	467.3363	468.4918	482.2401	498.5655	528.4002	548.4073	(73)

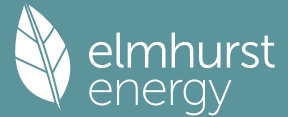
6. Solar gains

[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	
North				7.8800	10.6334	0.7600	0.8000		0.7700		35.3049 (74)	
East				2.7300	19.6403	0.7600	0.8000		0.7700		22.5916 (76)	
South				4.5600	46.7521	0.7600	0.8000		0.7700		89.8261 (78)	
Solar gains	147.7226	258.7754	374.8228	502.0961	598.8626	611.1326	582.2475	507.1487	418.2462	291.4275	178.1967	125.6281 (83)
Total gains	707.4089	830.4157	923.5188	1031.3720	1102.0027	1096.3674	1049.5839	975.6405	900.4862	789.9929	706.5969	674.0355 (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)													
tau	24.4140	24.5133	24.6115	25.0834	25.1737	25.6028	25.6028	25.6839	25.4358	25.1737	24.9917	24.8042	
alpha	2.6276	2.6342	2.6408	2.6722	2.6782	2.7069	2.7069	2.7123	2.6957	2.6782	2.6661	2.6536	
util living area													

Full SAP Calculation Printout



	0.9909	0.9854	0.9761	0.9538	0.9083	0.8192	0.7067	0.7489	0.8887	0.9641	0.9859	0.9921 (86)
Living	18.4868	18.6872	19.0356	19.5454	20.0445	20.4814	20.7023	20.6624	20.3156	19.6755	19.0136	18.4777
Non living	16.0892	16.3475	16.7934	17.4501	18.0568	18.5454	18.7155	18.7016	18.3893	17.6259	16.7833	16.0916
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	19.7144	18.6872	19.0356	19.5454	20.0445	20.4814	20.7023	20.6624	20.3156	19.6755	19.0136	18.8305 (87)
Th 2	18.8298	18.8359	18.8418	18.8702	18.8756	18.9007	18.9007	18.9054	18.8910	18.8756	18.8647	18.8535 (88)
util rest of house												
	0.9873	0.9795	0.9656	0.9304	0.8518	0.6813	0.4516	0.5112	0.7918	0.9410	0.9791	0.9889 (89)
MIT 2	17.7372	16.3475	16.7934	17.4501	18.0568	18.5454	18.7155	18.7016	18.3893	17.6259	16.7833	16.5893 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	18.2268	16.9269	17.3487	17.9690	18.5491	19.0248	19.2075	19.1872	18.8663	18.1335	17.3356	17.1443 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2268	16.9269	17.3487	17.9690	18.5491	19.0248	19.2075	19.1872	18.8663	18.1335	17.3356	17.1443 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9859	0.9713	0.9544	0.9157	0.8395	0.6922	0.4993	0.5536	0.7901	0.9282	0.9712	0.9851	(94)
Useful gains	697.4426	806.5927	881.3611	944.3933	925.1346	758.9262	524.0330	540.1173	711.4733	733.2951	686.2372	663.9816	(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	3269.7573	2812.2539	2526.6187	2072.4002	1559.5014	990.6219	583.7604	622.0276	1074.0858	1715.3404	2347.5730	2991.2633	(97)
Space heating kWh	1913.8021	1347.8043	1224.0717	812.1650	471.9689	0.0000	0.0000	0.0000	0.0000	730.6417	1196.1618	1731.4976	(98a)
Space heating requirement - total per year (kWh/year)												9428.1131	
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	1913.8021	1347.8043	1224.0717	812.1650	471.9689	0.0000	0.0000	0.0000	0.0000	730.6417	1196.1618	1731.4976	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9428.1131	
Space heating per m2										(98c) / (4) =		114.2248	(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 %)													397.9698 (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	1913.8021	1347.8043	1224.0717	812.1650	471.9689	0.0000	0.0000	0.0000	0.0000	730.6417	1196.1618	1731.4976	(98)
Space heating efficiency (main heating system 1)	397.9698	397.9698	397.9698	397.9698	397.9698	0.0000	0.0000	0.0000	0.0000	397.9698	397.9698	397.9698	(210)
Space heating fuel (main heating system)	480.8913	338.6700	307.5790	204.0771	118.5941	0.0000	0.0000	0.0000	0.0000	183.5922	300.5660	435.0827	(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	278.0342	245.9705	261.3714	229.7687	222.7481	200.7195	198.0170	205.8190	208.0271	231.9805	246.7130	274.9775	(64)
Efficiency of water heater (217)m	282.0373	282.0373	282.0373	282.0373	282.0373	282.0373	282.0373	282.0373	282.0373	282.0373	282.0373	282.0373	(216)
Fuel for water heating, kWh/month	98.5807	87.2121	92.6727	81.4675	78.9782	71.1677	70.2095	72.9758	73.7587	82.2517	87.4753	97.4969	(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	23.8391	19.1246	17.2196	12.6158	9.7448	7.9616	8.8895	11.5549	15.0087	19.6923	22.2424	24.5016	(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												2369.0525	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												282.0373	
Water heating fuel used												994.2468	(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)												192.3949	(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)

Full SAP Calculation Printout



Total delivered energy for all uses

3555.6941 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year	
Space heating - main system 1	2369.0525	0.1544	365.7420	(261)
Total CO ₂ associated with community systems			0.0000	(373)
Water heating (other fuel)	994.2468	0.1409	140.0687	(264)
Space and water heating			505.8107	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	192.3949	0.1443	27.7685	(268)
Total CO ₂ , kg/year			533.5792	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.4600	(273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year	
Space heating - main system 1	2369.0525	1.5715	3723.0377	(275)
Total CO ₂ associated with community systems			0.0000	(473)
Water heating (other fuel)	994.2468	1.5209	1512.1691	(278)
Space and water heating			5235.2068	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	192.3949	1.5338	295.1017	(282)
Total Primary energy kWh/year			5530.3084	(286)
Dwelling Primary energy Rate (DPER)			67.0000	(287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Main dwelling				
Ground floor	41.2700 (1b)	x 2.3000 (2b)	= 94.9210 (1b) - (3b)	
First floor	41.2700 (1c)	x 2.3000 (2c)	= 94.9210 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5400		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.8420 (5)	

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1580 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4080	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3774 (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	0.4812	0.4718	0.4623	0.4152	0.4057	0.3586	0.3586	0.3491	0.3774	0.4057	0.4246	0.4435 (22b)
Effective ac	0.6158	0.6113	0.6069	0.5862	0.5823	0.5643	0.5643	0.5609	0.5712	0.5823	0.5901	0.5983 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opaque door			4.7300	1.0000	4.7300		(26)
TER Opening Type			15.1700	1.1450	17.3702		(27)
Upgraded floor			41.2700	0.1300	5.3651		(28a)
Heatloss Floor 2			41.2700	0.1300	5.3651		(28a)
Upgraded wall	6.4300		6.4300	0.1800	1.1574		(29a)
New wall	7.4500	3.7300	3.7200	0.1800	0.6696		(29a)
match existing	13.1500		13.1500	0.1800	2.3670		(29a)
EXISTING WALL	126.0000	16.1700	109.8300	0.1800	19.7694		(29a)
Upgraded roof	41.2700		41.2700	0.1100	4.5397		(30)

Full SAP Calculation Printout



Total net area of external elements Aum(A, m2)	276.8400												(31)
Fabric heat loss, W/K = Sum (A x U)	(26) ... (30) + (32) =	61.3335											(33)
Main dwelling													
Party Wall 1	21.0000	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)													13.8420 (36)
Point Thermal bridges													0.0000
Total fabric heat loss													(33) + (36) + (36a) = 75.1755 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	38.5776	38.2959	38.0198	36.7230	36.4804	35.3509	35.3509	35.1418	35.7860	36.4804	36.9712	37.4844	(38)
Average = Sum(39)m / 12 =	113.7531	113.4714	113.1953	111.8986	111.6559	110.5265	110.5265	110.3173	110.9615	111.6559	112.1468	112.6599	(39)
													111.8974
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3782	1.3747	1.3714	1.3557	1.3527	1.3391	1.3391	1.3365	1.3443	1.3527	1.3587	1.3649	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5093 (42)
Hot water usage for mixer showers													
	66.2923	65.2960	63.8443	61.0667	59.0169	56.7310	55.4316	56.8724	58.4517	60.9061	63.7434	66.0383	(42a)
Hot water usage for baths													
	28.6311	28.2059	27.6071	26.5030	25.6763	24.7596	24.2645	24.8591	25.5065	26.4874	27.6142	28.5343	(42b)
Hot water usage for other uses													
	40.3276	38.8612	37.3947	35.9283	34.4618	32.9953	32.9953	34.4618	35.9283	37.3947	38.8612	40.3276	(42c)
Average daily hot water use (litres/day)													124.3263 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	135.2510	132.3631	128.8461	123.4980	119.1550	114.4859	112.6915	116.1933	119.8865	124.7882	130.2187	134.9002	(44)
Energy conte	214.2045	188.4833	198.0317	169.0626	160.4055	140.7738	136.2906	143.8715	147.8320	169.3364	185.5204	211.2211	(45)
Energy content (annual)													Total = Sum(45)m = 2065.0334
Distribution loss (46)m = 0.15 x (45)m													
	32.1307	28.2725	29.7048	25.3594	24.0608	21.1161	20.4436	21.5807	22.1748	25.4005	27.8281	31.6832	(46)
Water storage loss:													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.1127 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1409 (55)
Total storage loss													
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage													
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	272.8333	241.4383	256.6605	225.8001	219.0344	197.5114	194.9194	202.5004	204.5695	227.9652	242.2580	269.8499	(62)
WWHRS	-30.3061	-26.8029	-28.0665	-23.2402	-21.6590	-18.5338	-17.3724	-18.4738	-19.1757	-22.6061	-25.6099	-29.7448	(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	242.5273	214.6354	228.5940	202.5600	197.3754	178.9776	177.5470	184.0265	185.3938	205.3591	216.6480	240.1051	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2473.7492 (64)
Electric shower(s)													2474 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
	118.1261	105.0347	112.7486	101.6034	100.2379	92.1973	92.2197	94.7403	94.5442	103.2074	107.0756	117.1341	(65)

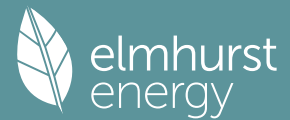
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	125.4645	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3652	127.7258	115.3652	119.2107	115.3652	119.2107	115.3652	115.3652	119.2107	115.3652	119.2107	115.3652	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	224.6671	226.9984	221.1235	208.6165	192.8287	177.9904	168.0775	165.7462	171.6211	184.1280	199.9159	214.7542	(68)
Pumps, fans	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	35.5465	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	-100.3716	(71)
Total internal gains	158.7716	156.3017	151.5438	141.1158	134.7284	128.0519	123.9512	127.3392	131.3114	138.7196	148.7161	157.4383	(72)
	562.4432	574.6652	551.6719	532.5824	506.5617	485.8924	468.0332	469.0899	482.7825	501.8522	531.4820	551.1970	(73)

6. Solar gains

[Jan]													
	Area												
	m2												
	Solar flux												
	Table 6a												
	W/m2												
	Specific data												
	or Table 6b												
	Specific data												
	or Table 6c												
	Access												
	factor												
	Table 6d												
	Gains												
	W												
North	7.8800												25.6077 (74)
East	2.7300												16.3863 (76)
South	4.5600												65.1535 (78)
Solar gains	107.1474	187.6973	271.8698	364.1848	434.3724	443.2722	422.3210	367.8496	303.3660	211.3808	129.2512	91.1217	(83)
Total gains	669.5907	762.3625	823.5417	896.7672	940.9340	929.1645	890.3542	836.9396	786.1486	713.2330	660.7333	642.3187	(84)

Full SAP Calculation Printout



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	50.3893	50.5144	50.6376	51.2245	51.3358	51.8604	51.8604	51.9587	51.6570	51.3358	51.1111	50.8783	
alpha	4.3593	4.3676	4.3758	4.4150	4.4224	4.4574	4.4574	4.4639	4.4438	4.4224	4.4074	4.3919	
util living area	0.9931	0.9871	0.9750	0.9386	0.8534	0.6917	0.5288	0.5790	0.8054	0.9519	0.9868	0.9942 (86)	
MIT	19.4604	19.6595	19.9534	20.3588	20.7051	20.9188	20.9806	20.9712	20.8338	20.3959	19.8654	19.4327 (87)	
Th 2	19.7801	19.7827	19.7853	19.7975	19.7997	19.8104	19.8104	19.8123	19.8063	19.7997	19.7951	19.7903 (88)	
util rest of house	0.9908	0.9828	0.9662	0.9160	0.7991	0.5896	0.3945	0.4427	0.7189	0.9293	0.9815	0.9923 (89)	
MIT 2	18.0241	18.2785	18.6510	19.1581	19.5546	19.7652	19.8046	19.8028	19.6967	19.2141	18.5506	17.9957 (90)	
Living area fraction									fLA = Living area / (4) =				0.2476 (91)
MIT	18.3798	18.6205	18.9735	19.4555	19.8395	20.0509	20.0958	20.0921	19.9783	19.5068	18.8762	18.3516 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.3798	18.6205	18.9735	19.4555	19.8395	20.0509	20.0958	20.0921	19.9783	19.5068	18.8762	18.3516 (93)	

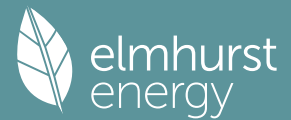
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9769	0.9583	0.9079	0.8011	0.6119	0.4280	0.4764	0.7331	0.9221	0.9758	0.9889 (94)
Useful gains	660.8071	744.7778	789.2141	814.1903	753.8275	568.5703	381.0314	398.7415	576.3268	657.7034	644.7551	635.1897 (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	1601.6216	1556.8884	1411.9448	1181.1410	908.8279	602.4680	386.3826	407.3061	652.2668	994.4951	1320.6599	1594.3137 (97)
Space heating kWh	699.9660	545.7383	463.3116	264.2045	115.3203	0.0000	0.0000	0.0000	0.0000	250.5731	486.6515	713.5883 (98a)
Space heating requirement - total per year (kWh/year)												3539.3535
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	699.9660	545.7383	463.3116	264.2045	115.3203	0.0000	0.0000	0.0000	0.0000	250.5731	486.6515	713.5883 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3539.3535
Space heating per m2										(98c) / (4) =		42.8805 (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	699.9660	545.7383	463.3116	264.2045	115.3203	0.0000	0.0000	0.0000	0.0000	250.5731	486.6515	713.5883	(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)	758.3597	591.2658	501.9628	286.2454	124.9407	0.0000	0.0000	0.0000	0.0000	271.4768	527.2497	773.1184	(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	242.5273	214.6354	228.5940	202.5600	197.3754	178.9776	177.5470	184.0265	185.3938	205.3591	216.6480	240.1051	(64)
Efficiency of water heater	86.2956	86.0602	85.6101	84.6566	82.8986	79.8000	79.8000	79.8000	79.8000	84.5071	85.8185	79.8000	(216)
Fuel for water heating, kWh/month	281.0426	249.4014	267.0177	239.2725	238.0926	224.2828	222.4899	230.6097	232.3231	243.0080	252.4491	278.0661	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.9706	19.2301	17.3146	12.6854	9.7986	8.0055	8.9386	11.6187	15.0916	19.8009	22.3651	24.6368	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.3704	-53.9725	-77.4093	-86.8390	-93.4719	-87.1783	-86.0858	-81.3392	-72.9535	-61.6050	-42.1341	-33.1867	(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	-22.0570	-46.3567	-92.0615	-138.1663	-182.5974	-183.4428	-181.2979	-153.5606	-112.6205	-66.2774	-29.4428	-17.4467	(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													3834.6192 (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													2958.0555 (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)													193.4566 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2039.8732 (233)
Wind generation													0.0000 (234)

Full SAP Calculation Printout



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	5032.2581 (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	3834.6192	0.2100	805.2700 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2958.0555	0.2100	621.1916 (264)
Space and water heating			1426.4617 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.4566	0.1443	27.9218 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-814.5456	0.1346	-109.6671
PV Unit electricity exported	-1225.3276	0.1259	-154.2890
Total			-263.9561 (269)
Total CO2, kg/year			1202.3566 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5700 (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	3834.6192	1.1300	4333.1197 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2958.0555	1.1300	3342.6027 (278)
Space and water heating			7675.7224 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.4566	1.5338	296.7302 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-814.5456	1.4976	-1219.8587
PV Unit electricity exported	-1225.3276	0.4622	-566.3480
Total			-1786.2067 (283)
Total Primary energy kWh/year			6316.3467 (286)
Target Primary Energy Rate (TPER)			76.5200 (287)

Energy Assessment

The Dower House, 393 High Street



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

Summary of DER, TER, DFEE, TFEE, DPER, TPER - New build

Plot	Multiplier	Area (m ²)	Baseline TER (kgCO ₂ /m ²)	Lean DER (kgCO ₂ /m ²)	Green DER (kgCO ₂ /m ²)	TFEE (kWh/m ²)	DFEE (kWh/m ²)	TPER (kWh/m ²)	DPER (kWh/m ²)
Plot 1	1	112.4	10.14	10.38	4.2	36.2	31.68	52.37	44.72
Plot 17	1	125.92	12.93	12.37	4.51	52.12	46.61	67.2	47.76
Plot 18	1	125.9	12.71	12.33	4.47	51.44	46.45	66.02	47.36
Plot 2	1	93.3	11.86	11.76	4.63	39.67	34.67	61.02	49.22
Plot 3,16	2	286.88	10.09	10.48	3.86	43.47	40.46	52.53	40.85
Plot 4, 6, 8, 12, 14	5	591.25	10.14	11.11	4.34	39.2	40.53	52.92	45.99
Plot 9,10	2	236.5	11.15	11.19	4.27	43.31	41.01	58.08	45.3
Plot 5, 7, 9, 11, 13	5	591.25	10.14	10.38	4.2	36.2	31.68	52.37	44.72

Energy Assessment

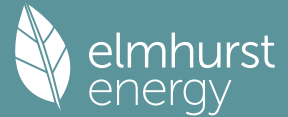
The Dower House, 393 High Street

eight
versa

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

Be Lean New build - DER from the Be Lean scenario DER SAP worksheet

Full SAP Calculation Printout



Property Reference	Plot 1	Issued on Date	07/11/2025
Assessment Reference	00001	Prop Type Ref	
Property			
SAP Rating	80 C	DER	10.38
Environmental	91 B	% DER < TER	-2.37
CO ₂ Emissions (t/year)	0.98	DFEE	31.68
Compliance Check	See BREL	% DFEE < TFEE	12.49
% DPER < TPER	-28.43	DPER	68.17
Assessor Details	Ms. Vanessa Vienna	Assessor ID	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	56.2000 (1b)	x 2.5000 (2b)	= 140.5000 (1b) - (3b)
First floor	56.2000 (1c)	x 2.3300 (2c)	= 130.9460 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 271.4460 (5)

2. Ventilation rate

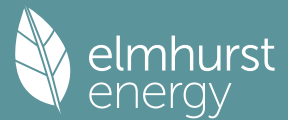
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			8.1500	1.1450	9.3321		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			2.0000	1.1450	2.2901		(27a)
Heatloss Floor 1			56.2000	0.1000	5.6200	110.0000	6182.0000 (28a)
External Wall 1	111.4000	10.0400	101.3600	0.1300	13.1768	190.0000	19258.4003 (29a)
pitched roof	75.0000	2.0000	73.0000	0.1000	7.3000	9.0000	657.0000 (30)
Total net area of external elements A _{um} (A, m ²)			242.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9869		(33)
Main dwelling							
Internal Wall 1			40.0800			9.0000	360.7200 (32c)
Internal Floor 1			56.2000			18.0000	1011.6000 (32d)
Internal Ceiling 1			56.2000			0.0000	0.0000 (32e)
Heat capacity C _m = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	27469.7203 (34)

Full SAP Calculation Printout



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

244.3925 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	17.8100	0.0900	1.6029
E17 Corner (inverted - internal area greater than external area)	4.2700	-0.0900	-0.3843
E5 Ground floor (normal)	30.6800	0.1600	4.9088
E6 Intermediate floor within a dwelling	21.8000	0.0700	1.5260
E13 Gable (insulation at rafter level)	16.6800	0.0400	0.6672
E11 Eaves (insulation at rafter level)	9.0700	0.0400	0.3628
R4 Ridge (vaulted ceiling)	9.0000	0.1200	1.0800
E2 Other lintels (including other steel lintels)	7.3200	0.2000	1.4640
E3 Sill	6.4300	0.0400	0.2572
E4 Jamb	22.6000	0.0500	1.1300
R8 Roof to wall (rafter)	9.0700	0.1200	1.0884

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

13.7030 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 53.6899 (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	25.6415	25.3056	24.9696	23.2901	22.9542	21.2746	21.2746	20.9387	21.9464	22.9542	23.6260	24.2978
Heat transfer coeff	79.3314	78.9955	78.6596	76.9800	76.6441	74.9645	74.9645	74.6286	75.6363	76.6441	77.3159	77.9877
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7058	0.7028	0.6998	0.6849	0.6819	0.6669	0.6669	0.6640	0.6729	0.6819	0.6879	0.6938
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8285 (42)
Hot water usage for mixer showers	71.6443	70.5676	68.9987	65.9968	63.7815	61.3111	59.9068	61.4639	63.1707	65.8233	68.8896	71.3698	(42a)
Hot water usage for baths	30.9326	30.4732	29.8263	28.6335	27.7403	26.7500	26.2150	26.8574	27.5569	28.6166	29.8340	30.8280	(42b)
Hot water usage for other uses	43.5966	42.0112	40.4259	38.8406	37.2552	35.6699	35.6699	37.2552	38.8406	40.4259	42.0112	43.5966	(42c)
Average daily hot water use (litres/day)													134.3663 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	146.1735	143.0521	139.2509	133.4709	128.7771	123.7309	121.7918	125.5766	129.5682	134.8658	140.7348	145.7944 (44)
Energy conte	231.5030	203.7042	214.0234	182.7150	173.3588	152.1416	147.2966	155.4900	159.7705	183.0116	200.5025	228.2788 (45)
Energy content (annual)										Total =	Sum(45) =	2231.7961
Distribution loss (46)m = 0.15 x (45)m	34.7255	30.5556	32.1035	27.4072	26.0038	22.8212	22.0945	23.3235	23.9656	27.4517	30.0754	34.2418 (46)

Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(47)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(48)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(49)

Total heat required for water heating calculated for each month	282.4619	249.7316	264.9823	232.0301	224.3177	201.4567	198.2555	206.4489	209.0856	233.9705	249.8176	279.2377	(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)
FV 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	282.4619	249.7316	264.9823	232.0301	224.3177	201.4567	198.2555	206.4489	209.0856	233.9705	249.8176	279.2377	(64)
Total per year (kWh/year)													(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	89.7145	79.2385	83.9025	73.0815	70.3815	62.9159	61.7158	64.4402	65.4525	73.5911	78.9959	88.6424	(65)
--	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	------

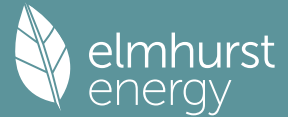
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.2307	179.6126	162.2307	167.6384	162.2307	167.6384	162.2307	162.2307	167.6384	162.2307	167.6384	162.2307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	274.9600	277.8133	270.6232	255.3165	235.9945	217.8345	205.7026	202.8493	210.0394	225.3461	244.6681	262.8281	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	(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)	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	(71)
Water heating gains (Table 5)	120.5840	117.9145	112.7722	101.5021	94.5988	87.3831	82.9514	86.6131	90.9062	98.9127	109.7165	119.1430	(72)
Total internal gains	626.2021	643.7676	614.0535	592.8843	561.2514	538.2834	516.3120	517.1205	534.0113	554.9169	590.4503	612.6292	(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
East	7.4300	19.6403	0.5500	0.7000	0.7700	38.9341 (76)
South	0.7200	46.7521	0.5500	0.7000	0.7700	8.9811 (78)
West	2.0000	26.0000	0.5500	0.7000	1.0000	18.0180 (82)

Full SAP Calculation Printout



Solar gains	65.9331	128.2940	210.6944	308.0584	379.3133	389.3351	370.2184	316.6329	245.1477	151.9769	82.0609	54.3310 (83)
Total gains	692.1352	772.0616	824.7479	900.9428	940.5646	927.6186	886.5304	833.7534	779.1590	706.8938	672.5112	666.9601 (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	96.1848	96.5938	97.0063	99.1229	99.5573	101.7879	101.7879	102.2460	100.8837	99.5573	98.6922	97.8420
alpha	7.4123	7.4396	7.4671	7.6082	7.6372	7.7859	7.7859	7.8164	7.7256	7.6372	7.5795	7.5228
util living area	0.9961	0.9903	0.9737	0.8980	0.7335	0.5157	0.3720	0.4115	0.6595	0.9299	0.9891	0.9969 (86)
MIT	20.4538	20.5554	20.6902	20.8616	20.9410	20.9589	20.9600	20.9600	20.9533	20.8478	20.6328	20.4453 (87)
Th 2	20.3357	20.3384	20.3410	20.3542	20.3569	20.3701	20.3701	20.3728	20.3648	20.3569	20.3516	20.3463 (88)
util rest of house	0.9950	0.9875	0.9663	0.8741	0.6902	0.4657	0.3188	0.3555	0.6030	0.9075	0.9855	0.9960 (89)
MIT 2	19.6877	19.8189	19.9901	20.2054	20.2899	20.3182	20.3188	20.3216	20.3090	20.1958	19.9291	19.6860 (90)
Living area fraction	19.7791	19.9068	20.0736	20.2836	20.3676	20.3946	20.3953	20.3978	20.3859	20.2736	20.0131	0.1193 (91)
MIT	19.7791	19.9068	20.0736	20.2836	20.3676	20.3946	20.3953	20.3978	20.3859	20.2736	20.0131	19.7766 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.6291	19.7568	19.9236	20.1336	20.2176	20.2446	20.2453	20.2478	20.2359	20.1236	19.8631	19.6266 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9933	0.9844	0.9605	0.8649	0.6804	0.4556	0.3082	0.3444	0.5912	0.8979	0.9819	0.9947 (94)
Useful gains	687.5221	759.9930	792.1944	779.2477	639.9972	422.6374	273.2481	287.1099	460.6288	634.7102	660.3462	663.4233 (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	1216.0797	1173.6184	1055.8942	864.7664	652.8252	423.1484	273.2679	287.1553	464.0939	729.9279	986.7885	1203.0830 (97)
Space heating kWh	393.2469	277.9562	196.1927	61.5734	9.5441	0.0000	0.0000	0.0000	0.0000	70.8420	235.0385	401.5068 (98a)
Space heating requirement - total per year (kWh/year)												1645.9006
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	393.2469	277.9562	196.1927	61.5734	9.5441	0.0000	0.0000	0.0000	0.0000	70.8420	235.0385	401.5068 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1645.9006
Space heating per m2										(98c) / (4) =		14.6432 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	393.2469	277.9562	196.1927	61.5734	9.5441	0.0000	0.0000	0.0000	0.0000	70.8420	235.0385	401.5068 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	439.3820	310.5656	219.2097	68.7971	10.6638	0.0000	0.0000	0.0000	0.0000	79.1530	262.6129	448.6110 (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	282.4619	249.7316	264.9823	232.0301	224.3177	201.4567	198.2555	206.4489	209.0856	233.9705	249.8176	279.2377 (64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	258.6626	227.6025	239.1323	204.1508	193.6969	169.9906	164.5772	173.7318	178.5145	204.4822	224.0251	255.0601 (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	74.9170	67.6670	74.9170	72.5003	74.9170	72.5003	74.9170	74.9170	72.5003	74.9170	72.5003	74.9170 (231)
Lighting	115.6971	92.8165	83.5710	61.2277	47.2940	38.6396	43.1432	56.0792	72.8413	95.5717	107.9480	118.9127 (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												1838.9951 (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												2493.6269 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7280)												
mechanical ventilation fans (SFP = 0.7280)												241.0875 (230a)

Full SAP Calculation Printout



central heating pump	41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000 (230f)
Total electricity for the above, kWh/year	882.0875 (231)
Electricity for lighting (calculated in Appendix L)	933.7421 (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	6148.4515 (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	1838.9951	0.2100	386.1890 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2493.6269	0.2100	523.6616 (264)
Space and water heating			909.8506 (265)
Pumps, fans and electric keep-hot	882.0875	0.1387	122.3564 (267)
Energy for lighting	933.7421	0.1443	134.7678 (268)
Total CO2, kg/year			1166.9749 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.3800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1838.9951	1.1300	2078.0644 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2493.6269	1.1300	2817.7984 (278)
Space and water heating			4895.8628 (279)
Pumps, fans and electric keep-hot	882.0875	1.5128	1334.4219 (281)
Energy for lighting	933.7421	1.5338	1432.2048 (282)
Total Primary energy kWh/year			7662.4895 (286)
Dwelling Primary energy Rate (DPER)			68.1700 (287)

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

1. Overall dwelling characteristics

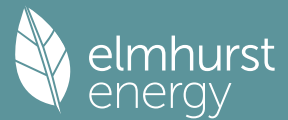
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	56.2000 (1b)	x 2.5000 (2b)	= 140.5000 (1b) - (3b)
First floor	56.2000 (1c)	x 2.3300 (2c)	= 130.9460 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	271.4460 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1474 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3974 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3974 (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	0.5066	0.4967	0.4868	0.4371	0.4272	0.3775	0.3775	0.3676	0.3974	0.4272	0.4470	0.4669 (22b)
Effective ac	0.6283	0.6234	0.6185	0.5955	0.5912	0.5712	0.5712	0.5675	0.5789	0.5912	0.5999	0.6090 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.1500	1.1450	9.3321			(27)
TER Roof Light			2.0000	1.5918	4.0441			(27a)
Heatloss Floor 1			56.2000	0.1300	7.3060			(28a)
External Wall 1	111.4000	10.0400	101.3600	0.1800	18.2448			(29a)
pitched roof	75.0000	2.0000	73.0000	0.1100	8.0300			(30)
Total net area of external elements Aum(A, m2)			242.6000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	48.8470		(33)

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

244.3925 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	17.8100	0.0900	1.6029	
E17 Corner (inverted - internal area greater than external area)	4.2700	-0.0900	-0.3843	
E5 Ground floor (normal)	30.6800	0.1600	4.9088	
E6 Intermediate floor within a dwelling	21.8000	0.0000	0.0000	
E13 Gable (insulation at rafter level)	16.6800	0.0800	1.3344	
E11 Eaves (insulation at rafter level)	9.0700	0.0400	0.3628	
R4 Ridge (vaulted ceiling)	9.0000	0.0800	0.7200	
E2 Other lintels (including other steel lintels)	7.3200	0.0500	0.3660	
E3 Sill	6.4300	0.0500	0.3215	
E4 Jamb	22.6000	0.0500	1.1300	
R8 Roof to wall (rafter)	9.0700	0.0600	0.5442	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.9063 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	59.7533 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	56.2848	55.8384	55.4008	53.3455	52.9610	51.1709	51.1709	50.8394	51.8604	52.9610	53.7389	54.5522	(38)
Average = Sum(39)m / 12 =	116.0381	115.5916	115.1541	113.0988	112.7143	110.9242	110.9242	110.5927	111.6137	112.7143	113.4922	114.3055	(39)
												113.0970	
HLP	1.0324	1.0284	1.0245	1.0062	1.0028	0.9869	0.9869	0.9839	0.9930	1.0028	1.0097	1.0170	(40)
HLP (average)												1.0062	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

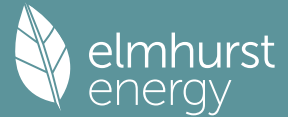
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8285 (42)
Hot water usage for mixer showers	71.6443	70.5676	68.9987	65.9968	63.7815	61.3111	59.9068	61.4639	63.1707	65.8233	68.8896	71.3698	(42a)
Hot water usage for baths	30.9326	30.4732	29.8263	28.6335	27.7403	26.7500	26.2150	26.8574	27.5569	28.6166	29.8340	30.8280	(42b)
Hot water usage for other uses	43.5966	42.0112	40.4259	38.8406	37.2552	35.6699	35.6699	37.2552	38.8406	40.4259	42.0112	43.5966	(42c)
Average daily hot water use (litres/day)												134.3663	(43)
Daily hot water use	146.1735	143.0521	139.2509	133.4709	128.7771	123.7309	121.7918	125.5766	129.5682	134.8658	140.7348	145.7944	(44)
Energy content (annual)	231.5030	203.7042	214.0234	182.7150	173.3588	152.1416	147.2966	155.4900	159.7705	183.0116	200.5025	228.2788	(45)
Distribution loss (46)m = 0.15 x (45)m	34.7255	30.5556	32.1035	27.4072	26.0038	22.8212	22.0945	23.3235	23.9656	27.4517	30.0754	34.2418	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	282.4619	249.7316	264.9823	232.0301	224.3177	201.4567	198.2555	206.4489	209.0856	233.9705	249.8176	279.2377	(62)
WWHRS	-32.7528	-28.9668	-30.3324	-25.1164	-23.4076	-20.0300	-18.7750	-19.9653	-20.7239	-24.4311	-27.6775	-32.1462	(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	249.7092	220.7648	234.6500	206.9136	200.9101	181.4266	179.4805	186.4836	188.3617	209.5393	222.1401	247.0915	(64)
12Total per year (kWh/year)												2527.4709	(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	89.7145	79.2385	83.9025	73.0815	70.3815	62.9159	61.7158	64.4402	65.4525	73.5911	78.9959	88.6424	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.2307	179.6126	162.2307	167.6384	162.2307	167.6384	162.2307	162.2307	167.6384	162.2307	167.6384	162.2307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	274.9600	277.8133	270.6232	255.3165	235.9945	217.8345	205.7026	202.8493	210.0394	225.3461	244.6681	262.8281	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	(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)	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	(71)
Water heating gains (Table 5)	120.5840	117.9145	112.7722	101.5021	94.5988	87.3831	82.9514	86.6131	90.9062	98.9127	109.7165	119.1430	(72)
Total internal gains	626.2021	643.7676	614.0535	592.8843	561.2514	538.2834	516.3120	517.1205	534.0113	554.9169	590.4503	612.6292	(73)

Full SAP Calculation Printout



6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W	
East	7.4300				19.6403	0.6300	0.7000	0.7700	0.7700	44.5972	(76)
South	0.7200				46.7521	0.6300	0.7000	0.7700	0.7700	10.2874	(78)
West	2.0000				26.0000	0.6300	0.7000	1.0000	1.0000	20.6388	(82)
Solar gains	75.5234	146.9549	241.3409	352.8669	434.4861	445.9657	424.0684	362.6886	280.8055	174.0826	62.2336 (83)
Total gains	701.7255	790.7226	855.3943	945.7513	995.7375	984.2491	940.3804	879.8091	814.8168	728.9995	674.8628 (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)											
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
alpha	65.7584	66.0124	66.2632	67.4674	67.6975	68.7900	68.7900	68.9962	68.3650	67.6975	67.2335
util living area	5.3839	5.4008	5.4175	5.4978	5.5132	5.5860	5.5860	5.5997	5.5577	5.5132	5.4822
	0.9973	0.9943	0.9868	0.9554	0.8673	0.6846	0.5125	0.5666	0.8226	0.9711	0.9942
MIT	19.7712	19.9324	20.1793	20.5363	20.8157	20.9639	20.9939	20.9897	20.9001	20.5366	20.1057
Th 2	20.0564	20.0597	20.0630	20.0782	20.0810	20.0943	20.0943	20.0968	20.0892	20.0810	20.0752
util rest of house	0.9964	0.9925	0.9823	0.9398	0.8233	0.6023	0.4105	0.4613	0.7529	0.9579	0.9919
MIT 2	18.6183	18.8265	19.1425	19.5976	19.9211	20.0729	20.0922	20.0929	20.0186	19.6067	19.0600
Living area fraction	18.7559	18.9584	19.2662	19.7096	20.0278	20.1792	20.1998	20.1999	20.1238	19.7176	19.1848
MIT	18.7559	18.9584	19.2662	19.7096	20.0278	20.1792	20.1998	20.1999	20.1238	19.7176	19.1848
Temperature adjustment											0.0000
adjusted MIT	18.7559	18.9584	19.2662	19.7096	20.0278	20.1792	20.1998	20.1999	20.1238	19.7176	19.1848

8. Space heating requirement

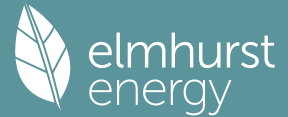
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9946	0.9894	0.9770	0.9320	0.8204	0.6104	0.4226	0.4736	0.7559	0.9510	0.9888	0.9956 (94)
Useful gains	697.9686	782.3426	835.7580	881.4098	816.9216	600.8131	397.3769	416.7082	615.9526	693.2766	676.7723	671.9137 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1677.4315	1625.0354	1470.0834	1222.5517	938.6661	618.8666	399.3036	420.2389	672.3397	1027.6873	1371.5276	1662.9782 (97)
Space heating kWh	728.7204	566.2895	471.9381	245.6222	90.5779	0.0000	0.0000	0.0000	0.0000	248.8016	500.2238	737.3520 (98a)
Space heating requirement - total per year (kWh/year)												3589.5254
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	728.7204	566.2895	471.9381	245.6222	90.5779	0.0000	0.0000	0.0000	0.0000	248.8016	500.2238	737.3520 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3589.5254
Space heating per m2										(98c) / (4) =		31.9353 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	728.7204	566.2895	471.9381	245.6222	90.5779	0.0000	0.0000	0.0000	0.0000	248.8016	500.2238	737.3520 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	788.6584	612.8675	510.7555	265.8248	98.0281	0.0000	0.0000	0.0000	0.0000	269.2658	541.3677	798.0000 (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	249.7092	220.7648	234.6500	206.9136	200.9101	181.4266	179.4805	186.4836	188.3617	209.5393	222.1401	247.0915 (64)
Efficiency of water heater	86.5347	86.3073	85.8468	84.7499	82.7887	80.3000	80.3000	80.3000	80.3000	84.7504	86.0655	86.5728 (216)
Fuel for water heating, kWh/month	288.5652	255.7893	273.3358	244.1462	242.6782	225.9361	223.5125	232.2336	234.5725	247.2427	258.1059	285.4146 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	33.7083	27.0421	24.3484	17.8387	13.7791	11.2576	12.5698	16.3387	21.2223	27.8448	31.4506	34.6452 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-50.9217	-70.9244	-100.6778	-111.6781	-119.0825	-110.6036	-109.2067	-103.7657	-93.9424	-80.3973	-55.6668	-44.1246 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-31.3662	-65.7004	-130.1014	-194.7260	-256.8587	-257.9185	-254.9068	-216.1124	-158.7657	-93.7483	-41.8040	-24.8261 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	3884.7678	1.1300	4389.7876 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3011.5326	1.1300	3403.0319 (278)
Space and water heating			7792.8195 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	272.0456	1.5338	417.2726 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1050.9914	1.4985	-1574.8918
PV Unit electricity exported	-1726.8344	0.4625	-798.6488
Total			-2373.5406 (283)
Total Primary energy kWh/year			5966.6523 (286)
Target Primary Energy Rate (TPER)			53.0800 (287)

Full SAP Calculation Printout



Property Reference	Plot 2	Issued on Date	07/11/2025
Assessment Reference	00001	Prop Type Ref	
Property			
SAP Rating	79 C	DER	11.76
Environmental	90 B	% DER < TER	0.84
CO ₂ Emissions (t/year)	0.91	DFEE	34.67
Compliance Check	See BREL	% DFEE < TFEE	12.60
% DPER < TPER	-22.87	DPER	76.39
Assessor Details	Ms. Vanessa Vienna	Assessor ID	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	46.6500 (1b)	x 2.5000 (2b)	= 116.6250 (1b) - (3b)
First floor	46.6500 (1c)	x 2.2200 (2c)	= 103.5630 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 220.1880 (5)

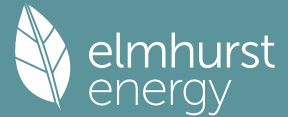
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.1912 0.1875 0.1837 0.1650 0.1612 0.1425 0.1425 0.1388 0.1500 0.1612 0.1687 0.1762 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.9000 (23c)
Effective ac	0.2817 0.2780 0.2742 0.2555 0.2517 0.2330 0.2330 0.2292 0.2405 0.2517 0.2592 0.2667 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			8.8500	1.1450	10.1336		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			1.3000	1.1450	1.4885		(27a)
Heatloss Floor 1			43.6500	0.1000	4.3650	110.0000	4801.5000 (28a)
External Wall 1	129.8700	10.7400	119.1300	0.1300	15.4869	190.0000	22634.6991 (29a)
pitched roof	67.9600	1.3000	66.6600	0.1000	6.6660	9.0000	599.9400 (30)
Total net area of external elements A _{um} (A, m ²)			241.4800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4080		(33)
Main dwelling							
Party Floor 1			130.7600			80.0000	10460.8000 (32d)
Internal Wall 1			28.1900			9.0000	253.7100 (32c)
Internal Floor 1			43.6500			18.0000	785.7000 (32d)
Internal Ceiling 1			43.6500			9.0000	392.8500 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	16.6800	0.0900	1.5012
E5 Ground floor (normal)	28.0000	0.1600	4.4800
E6 Intermediate floor within a dwelling	28.0000	0.0700	1.9600
E13 Gable (insulation at rafter level)	14.6100	0.0400	0.5844
E11 Eaves (insulation at rafter level)	18.6200	0.0400	0.7448
R4 Ridge (vaulted ceiling)	9.3100	0.1200	1.1172
E2 Other lintels (including other steel lintels)	7.1300	0.2000	1.4260
E3 Sill	6.2300	0.0400	0.2492
E4 Jamb	27.9000	0.0500	1.3950
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.4578 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	53.8658 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.4725	20.2000	19.9276	18.5652	18.2927	16.9303	16.9303	16.6578	17.4752	18.2927	18.8376	19.3826	(38)
Heat transfer coeff	74.3384	74.0659	73.7934	72.4310	72.1585	70.7961	70.7961	70.5236	71.3411	72.1585	72.7035	73.2484	(39)
Average = Sum(39)m / 12 =												72.3629	
HLP	0.7968	0.7938	0.7909	0.7763	0.7734	0.7588	0.7588	0.7559	0.7646	0.7734	0.7792	0.7851	(40)
HLP (average)												0.7756	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6682 (42)
Hot water usage for mixer showers	68.9575	67.9212	66.4112	63.5219	61.3897	59.0118	57.6603	59.1589	60.8017	63.3548	66.3061	68.6933	(42a)
Hot water usage for baths	29.7772	29.3350	28.7122	27.5640	26.7042	25.7508	25.2358	25.8542	26.5276	27.5477	28.7196	29.6766	(42b)
Hot water usage for other uses	41.9555	40.4299	38.9042	37.3786	35.8529	34.3273	34.3273	35.8529	37.3786	38.9042	40.4299	41.9555	(42c)
Average daily hot water use (litres/day)												129.3261	(43)
Daily hot water use	140.6903	137.6861	134.0276	128.4644	123.9468	119.0899	117.2234	120.8661	124.7079	129.8067	135.4556	140.3254	(44)
Energy conte	222.8191	196.0632	205.9955	175.8614	166.8562	146.4349	141.7715	149.6575	153.7773	176.1465	192.9814	219.7157	(45)
Energy content (annual)										Total = Sum(45)m =		2148.0800	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	33.4229	29.4095	30.8993	26.3792	25.0284	21.9652	21.2657	22.4486	23.0666	26.4220	28.9472	32.9574	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	273.7780	242.0906	256.9544	225.1764	217.8151	195.7500	192.7304	200.6164	203.0923	227.1054	242.2965	270.6746	(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	273.7780	242.0906	256.9544	225.1764	217.8151	195.7500	192.7304	200.6164	203.0923	227.1054	242.2965	270.6746	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2748.0800	(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	86.8271	76.6979	81.2332	70.8027	68.2194	61.0184	59.8787	62.5008	63.4597	71.3084	76.4951	85.7952	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

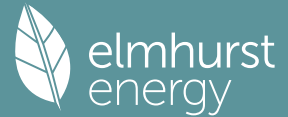
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.3712	154.3038	139.3712	144.0169	139.3712	144.0169	139.3712	139.3712	144.0169	139.3712	144.0169	139.3712	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.0196	247.5621	241.1550	227.5151	210.2970	194.1145	183.3036	180.7611	187.1682	200.8082	218.0262	234.2087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	(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)	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	(71)
Water heating gains (Table 5)	116.7030	114.1337	109.1844	98.3370	91.6927	84.7477	80.4822	84.0065	88.1385	95.8447	106.2432	115.3161	(72)
Total internal gains	567.1176	582.0234	555.7344	535.8927	507.3847	485.9029	466.1807	467.1625	482.3473	502.0478	534.3100	554.9197	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.3400	10.6334	0.5500	0.7000	0.7700	0.9646 (74)
East	2.8100	19.6403	0.5500	0.7000	0.7700	14.7247 (76)
South	1.9500	46.7521	0.5500	0.7000	0.7700	24.3237 (78)
West	3.7500	19.6403	0.5500	0.7000	0.7700	19.6505 (80)
North	1.3000	26.0000	0.5500	0.7000	1.0000	11.7117 (82)

Full SAP Calculation Printout



Solar gains	71.3752	133.2488	207.8627	291.4629	350.9676	357.4867	341.0130	296.3741	237.3748	154.6829	87.7485	59.5500 (83)
Total gains	638.4927	715.2722	763.5971	827.3556	858.3522	843.3896	807.1937	763.5365	719.7221	656.7306	622.0585	614.4697 (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	149.2021	149.7511	150.3040	153.1312	153.7094	156.6675	156.6675	157.2728	155.4707	153.7094	152.5573	151.4223
alpha	10.9468	10.9834	11.0203	11.2087	11.2473	11.4445	11.4445	11.4849	11.3647	11.2473	11.1705	11.0948
util living area	0.9997	0.9985	0.9929	0.9419	0.7706	0.5370	0.3859	0.4249	0.6810	0.9654	0.9983	0.9998 (86)
MIT	20.6246	20.6965	20.7922	20.9162	20.9667	20.9726	20.9727	20.9728	20.9713	20.9051	20.7475	20.6170 (87)
Th 2	20.2561	20.2587	20.2612	20.2739	20.2764	20.2892	20.2892	20.2917	20.2841	20.2764	20.2714	20.2663 (88)
util rest of house	0.9995	0.9977	0.9889	0.9161	0.7158	0.4775	0.3236	0.3595	0.6121	0.9435	0.9972	0.9996 (89)
MIT 2	19.8152	19.9093	20.0326	20.1894	20.2376	20.2542	20.2542	20.2569	20.2484	20.1827	19.9861	19.8145 (90)
Living area fraction	19.8152	19.9093	20.0326	20.1894	20.2376	20.2542	20.2542	20.2569	20.2484	20.1827	19.9861	19.8145 (90)
MIT	19.9628	20.0528	20.1711	20.3219	20.3705	20.3851	20.3852	20.3874	20.3802	20.3144	20.1249	19.9608 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.8128	19.9028	20.0211	20.1719	20.2205	20.2351	20.2352	20.2374	20.2302	20.1644	19.9749	19.8108 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9993	0.9972	0.9872	0.9119	0.7114	0.4730	0.3188	0.3544	0.6068	0.9392	0.9965	0.9995 (94)
Useful gains	638.0515	713.2437	753.8024	754.4298	610.6656	398.9064	257.3570	270.6257	436.7348	616.7823	619.8704	614.1803 (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	1153.1927	1111.1959	997.7687	816.4376	614.8257	398.9464	257.3573	270.6269	437.3327	690.1506	936.0496	1143.4643 (97)
Space heating kWh	383.2651	267.4239	181.5109	44.6456	3.0951	0.0000	0.0000	0.0000	0.0000	54.5860	227.6491	393.7873 (98a)
Space heating requirement - total per year (kWh/year)												1555.9629
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	383.2651	267.4239	181.5109	44.6456	3.0951	0.0000	0.0000	0.0000	0.0000	54.5860	227.6491	393.7873 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1555.9629
Space heating per m2										(98c) / (4) =		16.6770 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	383.2651	267.4239	181.5109	44.6456	3.0951	0.0000	0.0000	0.0000	0.0000	54.5860	227.6491	393.7873 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	428.2291	298.7976	202.8054	49.8834	3.4582	0.0000	0.0000	0.0000	0.0000	60.9899	254.3565	439.9858 (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	273.7780	242.0906	256.9544	225.1764	217.8151	195.7500	192.7304	200.6164	203.0923	227.1054	242.2965	270.6746 (64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	248.9598	219.0650	230.1625	196.4932	186.4315	163.6144	158.4039	167.2150	171.8182	196.8118	215.6217	245.4924 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	68.4952	61.8666	68.4952	66.2857	68.4952	66.2857	68.4952	68.4952	66.2857	68.4952	66.2857	68.4952 (231)
Lighting	99.3945	79.7380	71.7952	52.6002	40.6299	33.1950	37.0640	48.1772	62.5774	82.1049	92.7373	102.1570 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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)	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												1738.5060 (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												2400.0894 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6160)

Full SAP Calculation Printout



mechanical ventilation fans (SFP = 0.6160)	165.4757 (230a)
central heating pump	41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000 (230f)
Total electricity for the above, kWh/year	806.4757 (231)
Electricity for lighting (calculated in Appendix L)	802.1707 (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	5747.2419 (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	1738.5060	0.2100	365.0863 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2400.0894	0.2100	504.0188 (264)
Space and water heating			869.1050 (265)
Pumps, fans and electric keep-hot	806.4757	0.1387	111.8681 (267)
Energy for lighting	802.1707	0.1443	115.7780 (268)
Total CO2, kg/year			1096.7512 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.7600 (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	1738.5060	1.1300	1964.5118 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2400.0894	1.1300	2712.1011 (278)
Space and water heating			4676.6129 (279)
Pumps, fans and electric keep-hot	806.4757	1.5128	1220.0364 (281)
Energy for lighting	802.1707	1.5338	1230.3963 (282)
Total Primary energy kWh/year			7127.0456 (286)
Dwelling Primary energy Rate (DPER)			76.3900 (287)

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

1. Overall dwelling characteristics

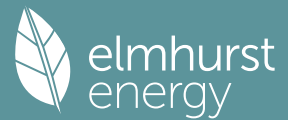
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	46.6500 (1b)	x 2.5000 (2b)	= 116.6250 (1b) - (3b)
First floor	46.6500 (1c)	x 2.2200 (2c)	= 103.5630 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 220.1880 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1362 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3862 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3862 (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	0.4925	0.4828	0.4732	0.4249	0.4152	0.3669	0.3669	0.3573	0.3862	0.4152	0.4345	0.4538 (22b)
Effective ac	0.6213	0.6166	0.6119	0.5903	0.5862	0.5673	0.5673	0.5638	0.5746	0.5862	0.5944	0.6030 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.8500	1.1450	10.1336		(27)
TER Roof Light			1.3000	1.5918	2.6287		(27a)
Heatloss Floor 1			43.6500	0.1300	5.6745		(28a)
External Wall 1	129.8700	10.7400	119.1300	0.1800	21.4434		(29a)
pitched roof	67.9600	1.3000	66.6600	0.1100	7.3326		(30)
Total net area of external elements Aum(A, m2)			241.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	49.1028	(33)

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

427.9657 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	16.6800	0.0900	1.5012
E5 Ground floor (normal)	28.0000	0.1600	4.4800
E6 Intermediate floor within a dwelling	28.0000	0.0000	0.0000
E13 Gable (insulation at rafter level)	14.6100	0.0800	1.1688
E11 Eaves (insulation at rafter level)	18.6200	0.0400	0.7448
R4 Ridge (vaulted ceiling)	9.3100	0.0800	0.7448
E2 Other lintels (including other steel lintels)	7.1300	0.0500	0.3565
E3 Sill	6.2300	0.0500	0.3115
E4 Jamb	27.9000	0.0500	1.3950
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.7026 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	59.8054 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	45.1421	44.7999	44.4646	42.8894	42.5946	41.2227	41.2227	40.9686	41.7511	42.5946	43.1909	43.8142 (38)
Average = Sum(39)m / 12 =	104.9475	104.6053	104.2699	102.6947	102.4000	101.0280	101.0280	100.7740	101.5565	102.4000	102.9962	103.6195 (39)
												102.6933

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1248	1.1212	1.1176	1.1007	1.0975	1.0828	1.0828	1.0801	1.0885	1.0975	1.1039	1.1106 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

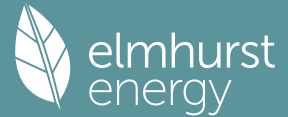
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6682 (42)
Hot water usage for mixer showers	68.9575	67.9212	66.4112	63.5219	61.3897	59.0118	57.6603	59.1589	60.8017	63.3548	66.3061	68.6933 (42a)
Hot water usage for baths	29.7772	29.3350	28.7122	27.5640	26.7042	25.7508	25.2358	25.8542	26.5276	27.5477	28.7196	29.6766 (42b)
Hot water usage for other uses	41.9555	40.4299	38.9042	37.3786	35.8529	34.3273	34.3273	35.8529	37.3786	38.9042	40.4299	41.9555 (42c)
Average daily hot water use (litres/day)												129.3261 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	140.6903	137.6861	134.0276	128.4644	123.9468	119.0899	117.2234	120.8661	124.7079	129.8067	135.4556	140.3254 (44)
Energy content (annual)	222.8191	196.0632	205.9955	175.8614	166.8562	146.4349	141.7715	149.6575	153.7773	176.1465	192.9814	219.7157 (45)
Distribution loss (46)m = 0.15 x (45)m	33.4229	29.4095	30.8993	26.3792	25.0284	21.9652	21.2657	22.4486	23.0666	26.4220	28.9472	32.9574 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	273.7780	242.0906	256.9544	225.1764	217.8151	195.7500	192.7304	200.6164	203.0923	227.1054	242.2965	270.6746 (62)
WWHRS	-31.5245	-27.8805	-29.1949	-24.1745	-22.5298	-19.2789	-18.0709	-19.2166	-19.9467	-23.5149	-26.6396	-30.9407 (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	242.2535	214.2101	227.7595	201.0019	195.2853	176.4711	174.6595	181.3998	183.1457	203.5905	215.6569	239.7339 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2455.1675 (64)
Electric shower(s)												2455 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	86.8271	76.6979	81.2332	70.8027	68.2194	61.0184	59.8787	62.5008	63.4597	71.3084	76.4951	85.7952 (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	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.3712	154.3038	139.3712	144.0169	139.3712	144.0169	139.3712	139.3712	144.0169	139.3712	144.0169	139.3712 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.0196	247.5621	241.1550	227.5151	210.2970	194.1145	183.3036	180.7611	187.1682	200.8082	218.0262	234.2087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412 (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)	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300 (71)
Water heating gains (Table 5)	116.7030	114.1337	109.1844	98.3370	91.6927	84.7477	80.4822	84.0065	88.1385	95.8447	106.2432	115.3161 (72)
Total internal gains	567.1176	582.0234	555.7344	535.8927	507.3847	485.9029	466.1807	467.1625	482.3473	502.0478	534.3100	554.9197 (73)

Full SAP Calculation Printout



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		
North					0.3400	10.6334	0.6300	0.7000	0.7700	1.1049 (74)		
East					2.8100	19.6403	0.6300	0.7000	0.7700	16.8665 (76)		
South					1.9500	46.7521	0.6300	0.7000	0.7700	27.8617 (78)		
West					3.7500	19.6403	0.6300	0.7000	0.7700	22.5087 (80)		
North					1.3000	26.0000	0.6300	0.7000	1.0000	13.4152 (82)		
Solar gains	81.7570	152.6304	238.0973	333.8575	402.0174	409.4848	390.6149	339.4830	271.9021	177.1822	100.5119	68.2118 (83)
Total gains	648.8746	734.6538	793.8316	869.7502	909.4021	895.3877	856.7956	806.6455	754.2493	679.2299	634.8219	623.1315 (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	105.6857	106.0314	106.3724	108.0040	108.3149	109.7858	109.7858	110.0626	109.2145	108.3149	107.6879	107.0401
alpha	8.0457	8.0688	8.0915	8.2003	8.2210	8.3191	8.3191	8.3375	8.2810	8.2210	8.1792	8.1360
util living area	0.9998	0.9993	0.9974	0.9833	0.9109	0.7081	0.5178	0.5723	0.8566	0.9909	0.9993	0.9998 (86)
MIT	20.1860	20.2992	20.4685	20.7135	20.9083	20.9907	20.9993	20.9985	20.9596	20.7101	20.4107	20.1744 (87)
Th 2	19.9806	19.9836	19.9865	20.0003	20.0028	20.0149	20.0149	20.0171	20.0102	20.0028	19.9976	19.9922 (88)
util rest of house	0.9997	0.9989	0.9957	0.9719	0.8592	0.6070	0.4025	0.4516	0.7679	0.9826	0.9988	0.9998 (89)
MIT 2	19.0373	19.1847	19.4033	19.7207	19.9375	20.0115	20.0148	20.0169	19.9903	19.7224	19.3390	19.0317 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.2467	19.3879	19.5975	19.9017	20.1145	20.1900	20.1943	20.1958	20.1670	19.9025	19.5344	19.2401 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2467	19.3879	19.5975	19.9017	20.1145	20.1900	20.1943	20.1958	20.1670	19.9025	19.5344	19.2401 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9995	0.9985	0.9948	0.9704	0.8660	0.6256	0.4236	0.4737	0.7838	0.9814	0.9984	0.9997 (94)
Useful gains	648.5612	733.5541	789.6794	843.9979	787.5426	560.1763	362.9570	382.1213	591.1865	666.5838	633.7913	622.9158 (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	1568.6187	1515.5073	1365.6801	1129.8166	861.6463	564.7477	363.1227	382.5215	616.1423	952.5726	1280.6952	1558.4433 (97)
Space heating kWh	684.5228	525.4725	428.5445	205.7895	55.1332	0.0000	0.0000	0.0000	0.0000	212.7757	465.7708	696.0325 (98a)
Space heating requirement - total per year (kWh/year)	3274.0414											
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	684.5228	525.4725	428.5445	205.7895	55.1332	0.0000	0.0000	0.0000	0.0000	212.7757	465.7708	696.0325 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3274.0414											
Space heating per m2	(98c) / (4) = 35.0915 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	684.5228	525.4725	428.5445	205.7895	55.1332	0.0000	0.0000	0.0000	0.0000	212.7757	465.7708	696.0325 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	740.8255	568.6932	463.7928	222.7159	59.6679	0.0000	0.0000	0.0000	0.0000	230.2767	504.0810	753.2819 (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	242.2535	214.2101	227.7595	201.0019	195.2853	176.4711	174.6595	181.3998	183.1457	203.5905	215.6569	239.7339 (64)
Water heating requirement	86.4790	86.2257	85.7143	84.4319	82.0475	80.3000	80.3000	80.3000	80.3000	84.4762	85.9856	80.3000 (216)
Efficiency of water heater (217)m	86.4790	86.2257	85.7143	84.4319	82.0475	80.3000	80.3000	80.3000	80.3000	84.4762	85.9856	86.5259 (217)
Fuel for water heating, kWh/month	280.1297	248.4296	265.7194	238.0638	238.0150	219.7647	217.5087	225.9026	228.0768	241.0035	250.8059	277.0659 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	28.9586	23.2316	20.9175	15.3251	11.8375	9.6714	10.7986	14.0364	18.2319	23.9213	27.0190	29.7634 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-43.0391	-60.3505	-86.2597	-96.3920	-103.4061	-96.2956	-95.0965	-90.0512	-81.0455	-68.7450	-47.1994	-37.2476 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-25.2657	-53.0577	-105.3034	-157.9452	-208.6518	-209.6040	-207.1436	-175.4704	-128.7202	-75.8082	-33.7083	-19.9864 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)

Full SAP Calculation Printout



(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												3543.3348	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2930.4856	(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)												233.7123	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2305.7932	(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												4487.7395	(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	3543.3348	0.2100	744.1003	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2930.4856	0.2100	615.4020	(264)
Space and water heating			1359.5023	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	233.7123	0.1443	33.7319	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-905.1282	0.1347	-121.9351	
PV Unit electricity exported	-1400.6650	0.1259	-176.3916	
Total			-298.3267	(269)
Total CO2, kg/year			1106.8367	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8600	(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	3543.3348	1.1300	4003.9684	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2930.4856	1.1300	3311.4487	(278)
Space and water heating			7315.4171	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	233.7123	1.5338	358.4757	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-905.1282	1.4979	-1355.7864	
PV Unit electricity exported	-1400.6650	0.4623	-647.4806	
Total			-2003.2670	(283)
Total Primary energy kWh/year			5800.7266	(286)
Target Primary Energy Rate (TPER)			62.1700	(287)

Full SAP Calculation Printout



Property Reference	Plot 3,16				Issued on Date	07/11/2025
Assessment Reference	00001		Prop Type Ref			
Property						
SAP Rating	81 B	DER	10.48	TER	10.09	
Environmental	90 B	% DER < TER				-3.87
CO ₂ Emissions (t/year)	1.27	DFEE	40.46	TFEE	43.47	
Compliance Check	See BREL	% DFEE < TFEE				6.93
% DPER < TPER	-26.54	DPER	66.73	TPER	52.73	
Assessor Details	Ms. Vanessa Vienna				Assessor ID	T798-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	65.6200 (1b)	x 2.5000 (2b)	= 164.0500 (1b) - (3b)
First floor	53.9000 (1c)	x 2.6000 (2c)	= 140.1400 (1c) - (3c)
Second floor	23.9200 (1d)	x 2.7300 (2d)	= 65.3016 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.4916 (5)

2. Ventilation rate

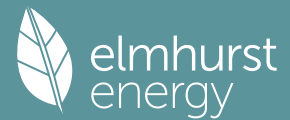
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2719	0.2684	0.2650	0.2476	0.2442	0.2268	0.2268	0.2233	0.2337	0.2442	0.2511	0.2580 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			13.9100	1.1450	15.9275		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			37.0400	1.1450	42.4122		(27a)
Heatloss Floor 1			65.6200	0.1000	6.5620	110.0000	(28a)
External Wall 1	134.1100	15.8000	118.3100	0.1300	15.3803	190.0000	(29a)
pitched roof	50.5700	37.0400	13.5300	0.1000	1.3530	9.0000	(30)
Roof 2	31.0000		31.0000	0.1000	3.1000	9.0000	(30)
Total net area of external elements A _{um} (A, m ²)			281.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.0030		(33)
Main dwelling							
Party Wall 1			58.1100	0.0000	0.0000	0.0000	(32)
Internal Wall 1			46.1000			9.0000	(32c)
Internal Floor 1			53.8700			18.0000	(32d)

Full SAP Calculation Printout



Internal Floor 2	23.9000	18.0000	430.2000 (32d)
Internal Ceiling 1	53.8700	9.0000	484.8300 (32e)
Internal Ceiling 2	23.9400	9.0000	215.4600 (32e)

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

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	16.6800	0.0900	1.5012
E5 Ground floor (normal)	24.9600	0.1600	3.9936
E6 Intermediate floor within a dwelling	24.9600	0.0700	1.7472
E13 Gable (insulation at rafter level)	2.7900	0.0400	0.1116
R8 Roof to wall (rafter)	27.2000	0.1200	3.2640
R4 Ridge (vaulted ceiling)	10.9000	0.1200	1.3080
E24 Eaves (insulation at ceiling level - inverted)	11.8000	0.1500	1.7700
E12 Gable (insulation at ceiling level)	13.2000	0.2500	3.3000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.4800	4.1760
P1 Party wall - Ground floor	9.3000	0.3200	2.9760
E18 Party wall between dwellings	11.3000	0.0600	0.6780
P4 Party wall - Roof (insulation at ceiling level)	3.1200	0.4800	1.4976
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
R6 Flat ceiling	11.6000	0.1200	1.3920
E2 Other lintels (including other steel lintels)	10.7300	0.2000	2.1460
E3 Sill	9.8300	0.0400	0.3932
E4 Jamb	26.7400	0.0500	1.3370

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	33.1541	32.7312	32.3082	30.1935	29.7705	27.6558	27.6558	27.2328	28.5017	29.7705	30.6164	31.4623	(38)
Average = Sum(39)m / 12 =	151.2985	150.8756	150.4526	148.3379	147.9149	145.8001	145.8001	145.3772	146.6461	147.9149	148.7608	149.6067	(39)
												148.2321	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0548	1.0518	1.0489	1.0341	1.0312	1.0165	1.0165	1.0135	1.0224	1.0312	1.0371	1.0430	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

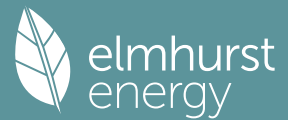
Assumed occupancy													2.9234 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.4200	146.2292	142.3435	136.4352	131.6371	126.4788	124.4967	128.3655	132.4458	137.8611	143.8605	149.0325	(44)
Energy content (annual)	236.6447	208.2284	218.7767	186.7729	177.2088	155.5205	150.5679	158.9434	163.3190	187.0762	204.9556	233.3489	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	35.4967	31.2343	32.8165	28.0159	26.5813	23.3281	22.5852	23.8415	24.4978	28.0614	30.7433	35.0023	(46)
Total storage loss													
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(59)
Total heat required for water heating calculated for each month													
WWHRS	287.6036	254.2558	269.7356	236.0880	228.1678	204.8356	201.5268	209.9023	212.6340	238.0351	254.2707	284.3078	(62)
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	(63a)
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	(63b)
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	(63c)
Output from w/h													
12Total per year (kWh/year)	287.6036	254.2558	269.7356	236.0880	228.1678	204.8356	201.5268	209.9023	212.6340	238.0351	254.2707	284.3078	(64)
Electric shower(s)													
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	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	91.4241	80.7428	85.4830	74.4308	71.6617	64.0393	62.8036	65.5884	66.6323	74.9426	80.4765	90.3282	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.0191	174.9497	158.0191	163.2864	158.0191	163.2864	158.0191	158.0191	163.2864	158.0191	163.2864	158.0191	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	313.2905	316.5414	308.3491	290.9085	268.8930	248.2015	234.3783	231.1273	239.3196	256.7602	278.7757	299.4673	(68)
Pumps, fans	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	(71)
Total internal gains	122.8818	120.1530	114.8965	103.3761	96.3194	88.9435	84.4134	88.1564	92.5449	100.7293	111.7729	121.4089	(72)
	664.0419	681.4946	651.1151	627.4215	593.0820	567.2818	543.6612	544.1533	562.0014	585.3590	623.6855	648.7457	(73)

6. Solar gains

Full SAP Calculation Printout



[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
North	1.9500	10.6334	0.5500	0.7000	0.7700	5.5322 (74)
South	11.9600	46.7521	0.5500	0.7000	0.7700	149.1853 (78)
North	36.2400	26.0000	0.5500	0.7000	1.0000	326.4862 (82)
South	0.8000	26.0000	0.5500	0.7000	1.0000	7.2072 (82)

Solar gains	488.4109	947.9548	1561.2929	2305.7672	2869.6217	2961.2426	2809.2107	2380.5358	1822.6670	1123.1824	607.1940	403.0433 (83)
Total gains	1152.4527	1629.4494	2212.4080	2933.1886	3462.7036	3528.5244	3352.8719	2924.6890	2384.6683	1708.5414	1230.8796	1051.7890 (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	59.8760	60.0438	60.2126	61.0710	61.2456	62.1340	62.1340	62.3148	61.7756	61.2456	60.8974	60.5531
alpha	4.9917	5.0029	5.0142	5.0714	5.0830	5.1423	5.1423	5.1543	5.1184	5.0830	5.0598	5.0369
util living area	0.9891	0.9509	0.8278	0.5912	0.3951	0.2642	0.1913	0.2286	0.4213	0.7889	0.9694	0.9927 (86)
MIT	20.0848	20.3966	20.7226	20.9014	20.9343	20.9393	20.9397	20.9397	20.9350	20.8213	20.3988	20.0325 (87)
Th 2	20.0379	20.0404	20.0428	20.0550	20.0574	20.0696	20.0696	20.0721	20.0647	20.0574	20.0525	20.0477 (88)
util rest of house	0.9860	0.9391	0.7976	0.5502	0.3558	0.2259	0.1509	0.1825	0.3654	0.7425	0.9599	0.9907 (89)
MIT 2	18.9757	19.3652	19.7478	19.9442	19.9758	19.9921	19.9923	19.9949	19.9845	19.8758	19.3836	18.9172 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.2282	19.6001	19.9698	20.1622	20.1941	20.2078	20.2080	20.2100	20.2009	20.0911	19.6147	19.1711 (92)
Temperature adjustment												
adjusted MIT	19.0782	19.4501	19.8198	20.0122	20.0441	20.0578	20.0580	20.0600	20.0509	19.9411	19.4647	19.0211 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9819	0.9303	0.7899	0.5483	0.3552	0.2254	0.1504	0.1819	0.3646	0.7362	0.9525	0.9876 (94)
Useful gains	1131.6335	1515.9402	1747.6751	1608.3068	1230.0118	795.4505	504.1530	532.0171	869.4428	1257.8178	1172.4100	1038.7270 (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	2235.9188	2195.2502	2003.9964	1648.3536	1234.2140	795.7414	504.1781	532.0838	872.6738	1381.6833	1839.3856	2217.3362 (97)
Space heating kWh	821.5883	456.4963	190.7030	28.8337	3.1264	0.0000	0.0000	0.0000	0.0000	92.1559	480.2224	876.8853 (98a)
Space heating requirement - total per year (kWh/year)	2950.0114											
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	821.5883	456.4963	190.7030	28.8337	3.1264	0.0000	0.0000	0.0000	0.0000	92.1559	480.2224	876.8853 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2950.0114											
Space heating per m2	(98c) / (4) = 20.5662 (99)											

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	821.5883	456.4963	190.7030	28.8337	3.1264	0.0000	0.0000	0.0000	0.0000	92.1559	480.2224	876.8853 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	917.9757	510.0518	213.0760	32.2165	3.4932	0.0000	0.0000	0.0000	0.0000	102.9675	536.5613	979.7601 (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	287.6036 254.2558 269.7356 236.0880 228.1678 204.8356 201.5268 209.9023 212.6340 238.0351 254.2707 284.3078 (64)
Efficiency of water heater (217)m	89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 (216)
Fuel for water heating, kWh/month	264.4075 232.6574 244.4432 208.6848 197.9987 173.7659 168.2323 177.5904 182.4793 209.0237 229.0007 260.7250 (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	88.2088 79.6725 88.2088 85.3634 88.2088 85.3634 88.2088 88.2088 85.3634 88.2088 85.3634 88.2088 (231)
Lighting	112.6935 90.4069 81.4014 59.6382 46.0662 37.6365 42.0232 54.6233 70.9503 93.0906 105.1456 115.8256 (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)	

Full SAP Calculation Printout



(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												3296.1021	(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												2549.0090	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)													
mechanical ventilation fans (SFP = 0.8820)												397.5877	(230a)
central heating pump												41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler												600.0000	(230f)
Total electricity for the above, kWh/year												1038.5877	(231)
Electricity for lighting (calculated in Appendix L)												909.5014	(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												7793.2002	(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	3296.1021	0.2100	692.1814	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2549.0090	0.2100	535.2919	(264)
Space and water heating			1227.4733	(265)
Pumps, fans and electric keep-hot	1038.5877	0.1387	144.0649	(267)
Energy for lighting	909.5014	0.1443	131.2692	(268)
Total CO2, kg/year			1502.8074	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3296.1021	1.1300	3724.5954	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2549.0090	1.1300	2880.3801	(278)
Space and water heating			6604.9755	(279)
Pumps, fans and electric keep-hot	1038.5877	1.5128	1571.1755	(281)
Energy for lighting	909.5014	1.5338	1395.0236	(282)
Total Primary energy kWh/year			9571.1746	(286)
Dwelling Primary energy Rate (DPER)			66.7300	(287)

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

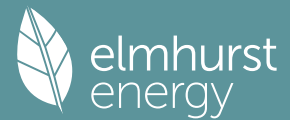
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	65.6200 (1b)	x 2.5000 (2b)	= 164.0500 (1b) - (3b)	
First floor	53.9000 (1c)	x 2.6000 (2c)	= 140.1400 (1c) - (3c)	
Second floor	23.9200 (1d)	x 2.7300 (2d)	= 65.3016 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.4400			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	369.4916 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1083 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3583	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3314 (21)

Full SAP Calculation Printout



Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4225	0.4142	0.4059	0.3645	0.3562	0.3148	0.3148	0.3065	0.3314	0.3562	0.3728	0.3894 (22b)
Effective ac	0.5893	0.5858	0.5824	0.5664	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			9.2700	1.1450	10.6145		(27)
TER Roof Light			24.7000	1.5918	49.9449		(27a)
Heatloss Floor 1			65.6200	0.1300	8.5306		(28a)
External Wall 1	134.1100	11.1600	122.9500	0.1800	22.1310		(29a)
pitched roof	50.5700	24.7000	25.8700	0.1100	2.8457		(30)
Roof 2	31.0000		31.0000	0.1100	3.4100		(30)
Total net area of external elements Aum(A, m2)			281.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	99.3667		(33)
Main dwelling							
Party Wall 1			58.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							227.3628 (35)

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

List of Thermal Bridges												
K1 Element												
E16 Corner (normal)						16.6800		Psi-value			Total	
E5 Ground floor (normal)						24.9600		0.0900			1.5012	
E6 Intermediate floor within a dwelling						24.9600		0.1600			3.9936	
E13 Gable (insulation at rafter level)						24.9600		0.0000			0.0000	
R8 Roof to wall (rafter)						2.7900		0.0800			0.2232	
R4 Ridge (vaulted ceiling)						27.2000		0.0600			1.6320	
E24 Eaves (insulation at ceiling level - inverted)						10.9000		0.0800			0.8720	
E12 Gable (insulation at ceiling level)						11.8000		0.2400			2.8320	
P5 Party wall - Roof (insulation at rafter level)						13.2000		0.0600			0.7920	
P1 Party wall - Ground floor						8.7000		0.0800			0.6960	
E18 Party wall between dwellings						9.3000		0.0800			0.7440	
P4 Party wall - Roof (insulation at ceiling level)						11.3000		0.0600			0.6780	
E17 Corner (inverted - internal area greater than external area)						3.1200		0.1200			0.3744	
R6 Flat ceiling						5.0000		-0.0900			-0.4500	
E2 Other lintels (including other steel lintels)						11.6000		0.0600			0.6960	
E3 Sill						10.7300		0.0500			0.5365	
E4 Jamb						9.8300		0.0500			0.4915	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						26.7400		0.0500			1.3370	
Point Thermal Bridges											16.9494 (36)	
Total fabric heat loss											0.0000 (36a) =	
											(33) + (36) + (36a) =	116.3161 (37)

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

(38)m	Jan 71.8499	Feb 71.4273	Mar 71.0130	Apr 69.0673	May 68.7032	Jun 67.0085	Jul 67.0085	Aug 66.6947	Sep 67.6613	Oct 68.7032	Nov 69.4397	Dec 70.2096 (38)
Heat transfer coeff	188.1660	187.7434	187.3291	185.3833	185.0193	183.3246	183.3246	183.0107	183.9773	185.0193	185.7557	186.5257 (39)
Average = Sum(39)m / 12 =												185.3816
HLP	Jan 1.3118	Feb 1.3089	Mar 1.3060	Apr 1.2924	May 1.2899	Jun 1.2781	Jul 1.2781	Aug 1.2759	Sep 1.2826	Oct 1.2899	Nov 1.2950	Dec 1.3004 (40)
HLP (average)												1.2924
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9234 (42)
Hot water usage for mixer showers													
73.2351	72.1345	70.5307	67.4622	65.1977	62.6724	61.2370	62.8286	64.5734	67.2848	70.4192	72.9545 (42a)		
Hot water usage for baths													
31.6167	31.1471	30.4859	29.2667	28.3538	27.3415	26.7948	27.4514	28.1663	29.2495	30.4938	31.5098 (42b)		
Hot water usage for other uses													
44.5682	42.9475	41.3269	39.7062	38.0855	36.4649	36.4649	38.0855	39.7062	41.3269	42.9475	44.5682 (42c)		
Average daily hot water use (litres/day)												137.3505 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
149.4200	146.2292	142.3435	136.4352	131.6371	126.4788	124.4967	128.3655	132.4458	137.8611	143.8605	149.0325 (44)		
Energy conte	236.6447	208.2284	218.7767	186.7729	177.2088	155.5205	150.5679	158.9434	163.3190	187.0762	204.9556	233.3489 (45)	
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
35.4967	31.2343	32.8165	28.0159	26.5813	23.3281	22.5852	23.8415	24.4978	28.0614	30.7433	35.0023 (46)		
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)		
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)		
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)		
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
287.6036	254.2558	269.7356	236.0880	228.1678	204.8356	201.5268	209.9023	212.6340	238.0351	254.2707	284.3078 (62)		
WWHRS	-33.4800	-29.6100	-31.0059	-25.6741	-23.9273	-20.4748	-19.1919	-20.4086	-21.1840	-24.9736	-28.2921	-32.8600 (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 (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 (63c)		
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)		
Output from w/h	254.1236	224.6458	238.7297	210.4139	204.2404	184.3608	182.3350	189.4937	191.4500	213.0615	225.9786	251.4477 (64)	
12Total per year (kWh/year)												2570.2807 (64)	
Electric shower(s)												2570 (64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)	
Heat gains from water heating, kWh/month													
91.4241	80.7428	85.4830	74.4308	71.6617	64.0393	62.8036	65.5884	66.6323	74.9426	80.4765	90.3282 (65)		

Full SAP Calculation Printout



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	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0191	174.9497	158.0191	163.2864	158.0191	163.2864	158.0191	158.0191	163.2864	158.0191	163.2864	158.0191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	313.2905	316.5414	308.3491	290.9085	268.8930	248.2015	234.3783	231.1273	239.3196	256.7602	278.7757	299.4673 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346 (71)
Water heating gains (Table 5)	122.8818	120.1530	114.8965	103.3761	96.3194	88.9435	84.4134	88.1564	92.5449	100.7293	111.7729	121.4089 (72)
Total internal gains	664.0419	681.4946	651.1151	627.4215	593.0820	567.2818	543.6612	544.1533	562.0014	585.3590	623.6855	648.7457 (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
North				1.3000	10.6334		0.6300		0.7000		0.7700		4.2246 (74)
South				7.9700	46.7521		0.6300		0.7000		0.7700		113.8757 (78)
North				24.1700	26.0000		0.6300		0.7000		1.0000		249.4199 (82)
South				0.5300	26.0000		0.6300		0.7000		1.0000		5.4693 (82)
Solar gains	372.9895	723.9577	1192.4147	1761.0522	2191.7385	2261.7291	2145.6055	1818.1722	1392.0553	857.7934	463.7063	307.7929	(83)
Total gains	1037.0313	1405.4522	1843.5298	2388.4737	2784.8204	2829.0109	2689.2667	2362.3255	1954.0567	1443.1524	1087.3918	956.5386	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.1444	48.2528	48.3595	48.8671	48.9632	49.4159	49.4159	49.5006	49.2405	48.9632	48.7691	48.5678
alpha	4.2096	4.2169	4.2240	4.2578	4.2642	4.2944	4.2944	4.3000	4.2827	4.2642	4.2513	4.2379
util living area	0.9937	0.9784	0.9280	0.7836	0.5850	0.4091	0.2987	0.3536	0.6097	0.9060	0.9852	0.9954 (86)
MIT	19.3523	19.7139	20.2147	20.7090	20.9282	20.9876	20.9975	20.9949	20.9387	20.5169	19.8176	19.2944 (87)
Th 2	19.8316	19.8339	19.8362	19.8468	19.8488	19.8581	19.8581	19.8598	19.8545	19.8488	19.8447	19.8405 (88)
util rest of house	0.9917	0.9721	0.9088	0.7387	0.5225	0.3385	0.2218	0.2673	0.5231	0.8721	0.9799	0.9940 (89)
MIT 2	17.9354	18.3940	19.0114	19.5805	19.7959	19.8518	19.8573	19.8582	19.8177	19.3937	18.5372	17.8675 (90)
Living area fraction	18.2580	18.6945	19.2854	19.8375	20.0537	20.1104	20.1169	20.1170	20.0729	19.6494	18.8287	18.1924 (92)
MIT	18.2580	18.6945	19.2854	19.8375	20.0537	20.1104	20.1169	20.1170	20.0729	19.6494	18.8287	18.1924 (93)
Temperature adjustment												0.0000
adjusted MIT	18.2580	18.6945	19.2854	19.8375	20.0537	20.1104	20.1169	20.1170	20.0729	19.6494	18.8287	18.1924 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9878	0.9638	0.8977	0.7383	0.5340	0.3543	0.2393	0.2870	0.5404	0.8650	0.9732	0.9910 (94)
Useful gains	1024.3779	1354.5273	1654.9446	1763.4484	1487.1038	1002.3549	643.6758	677.9543	1055.9534	1248.2633	1058.2504	947.8826 (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	2626.4266	2589.8340	2395.0684	2027.6261	1545.5985	1010.1861	644.7399	680.2497	1098.8791	1674.3188	2178.6795	2609.9394 (97)
Space heating kWh	1191.9242	830.1261	550.6521	190.2080	43.5201	0.0000	0.0000	0.0000	0.0000	316.9853	806.7090	1236.5703 (98a)
Space heating requirement - total per year (kWh/year)												5166.6951
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	1191.9242	830.1261	550.6521	190.2080	43.5201	0.0000	0.0000	0.0000	0.0000	316.9853	806.7090	1236.5703 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5166.6951
Space heating per m ²										(98c) / (4) =		36.0199 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1191.9242	830.1261	550.6521	190.2080	43.5201	0.0000	0.0000	0.0000	0.0000	316.9853	806.7090	1236.5703 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	1289.9613	898.4049	595.9439	205.8528	47.0997	0.0000	0.0000	0.0000	0.0000	343.0577	873.0616	1338.2795 (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

Full SAP Calculation Printout



Efficiency of water heater (217)m	254.1236	224.6458	238.7297	210.4139	204.2404	184.3608	182.3350	189.4937	191.4500	213.0615	225.9786	251.4477 (64)
Fuel for water heating, kWh/month	87.2577	86.9174	86.1109	84.1657	81.6881	80.3000	80.3000	80.3000	80.3000	85.2308	86.8643	80.3000 (216)
Space cooling fuel requirement (221)m	291.2334	258.4589	277.2351	249.9996	250.0248	229.5900	227.0672	235.9821	238.4185	249.9818	260.1515	287.9622 (219)
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 (221)
Lighting	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.3041	7.3041	7.0685	7.3041 (231)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	32.8332	26.3400	23.7163	17.3756	13.4214	10.9654	12.2434	15.9145	20.6713	27.1219	30.6342	33.7458 (232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-58.7792	-81.5674	-115.3998	-127.5877	-135.6979	-125.8762	-124.1821	-118.0563	-107.1071	-92.0981	-64.1000	-50.9601 (233a)
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 (234a)
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 (235a)
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 (235c)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-37.3014	-77.9578	-154.0615	-230.1745	-303.2569	-304.4160	-300.9626	-255.4383	-187.9588	-111.2371	-49.7084	-29.5478 (233b)
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 (234b)
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 (235b)
Annual totals kWh/year												
Space heating fuel - main system 1												5591.6614 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3056.1050 (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)												264.9831 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3243.4330 (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												5755.3163 (238)

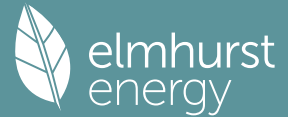
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5591.6614	0.2100	1174.2489 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3056.1050	0.2100	641.7820 (264)
Space and water heating			1816.0309 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	264.9831	0.1443	38.2452 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1201.4120	0.1350	-162.1348
PV Unit electricity exported	-2042.0211	0.1260	-257.3809
Total			-419.5157 (269)
Total CO2, kg/year			1446.6897 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0900 (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	5591.6614	1.1300	6318.5774 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3056.1050	1.1300	3453.3986 (278)
Space and water heating			9771.9760 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	264.9831	1.5338	406.4399 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1201.4120	1.4988	-1800.6596
PV Unit electricity exported	-2042.0211	0.4627	-944.7768
Total			-2745.4364 (283)
Total Primary energy kWh/year			7563.0802 (286)
Target Primary Energy Rate (TPER)			52.7300 (287)

Full SAP Calculation Printout



Property Reference	Plot 4, 6, 8, 12, 14				Issued on Date	07/11/2025		
Assessment Reference	00001			Prop Type Ref				
Property								
SAP Rating	80 C		DER	11.11		TER	10.14	
Environmental	90 B		% DER < TER				-9.57	
CO ₂ Emissions (t/year)	1.14		DFEE	40.53		TFEE	39.20	
Compliance Check	See BREL		% DFEE < TFEE				-3.40	
% DPER < TPER	-34.96		DPER	71.30		TPER	52.83	
Assessor Details	Ms. Vanessa Vienna					Assessor ID	T798-0001	
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	48.3600 (1b)	x 2.5000 (2b)	= 120.9000 (1b) - (3b)
First floor	48.3900 (1c)	x 2.6100 (2c)	= 126.2979 (1c) - (3c)
Second floor	21.5000 (1d)	x 2.5900 (2d)	= 55.6850 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 302.8829 (5)

2. Ventilation rate

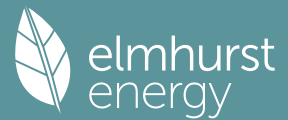
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			8.6200	1.1450	9.8702		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			37.0400	1.1450	42.4122		(27a)
Heatloss Floor 1			48.3600	0.1000	4.8360	110.0000	5319.6000 (28a)
External Wall 1	59.0200	10.5100	48.5100	0.1300	6.3063	190.0000	9216.9001 (29a)
pitched roof	45.3900	37.0400	8.3500	0.1000	0.8350	9.0000	75.1500 (30)
Roof 2	17.2000		17.2000	0.1000	1.7200	9.0000	154.8000 (30)
Total net area of external elements A _{um} (A, m ²)			169.9700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.2477		(33)
Main dwelling							
Party Wall 1			116.2800	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall 1			38.0000			9.0000	342.0000 (32c)
Internal Floor 1			48.3600			18.0000	870.4800 (32d)

Full SAP Calculation Printout



Internal Floor 2	21.5200	18.0000	387.3600 (32d)
Internal Ceiling 1	48.3000	9.0000	434.7000 (32e)
Internal Ceiling 2	21.0700	9.0000	189.6300 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 16990.6201 (34)
List of Thermal Bridges
143.6839 (35)

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	10.3900	0.1600	1.6624
E6 Intermediate floor within a dwelling	10.3900	0.0700	0.7273
R8 Roof to wall (rafter)	20.8000	0.1200	2.4960
R4 Ridge (vaulted ceiling)	5.2000	0.1200	0.6240
E24 Eaves (insulation at ceiling level - inverted)	10.6500	0.1500	1.5975
P5 Party wall - Roof (insulation at rafter level)	17.4600	0.4800	8.3808
P1 Party wall - Ground floor	18.6200	0.3200	5.9584
E18 Party wall between dwellings	22.7000	0.0600	1.3620
P4 Party wall - Roof (insulation at ceiling level)	6.5100	0.4800	3.1248
E2 Other lintels (including other steel lintels)	6.8500	0.2000	1.3700
E3 Sill	5.9500	0.0400	0.2380
E4 Jamb	17.9000	0.0500	0.8950
P2 Party wall - Intermediate floor within a dwelling	27.0300	0.0000	0.0000
R6 Flat ceiling	10.3900	0.1200	1.2468

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 97.9307 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.7437	25.4251	25.1065	23.5136	23.1950	21.6020	21.6020	21.2834	22.2392	23.1950	23.8322	24.4693 (38)
Heat transfer coeff	123.6745	123.3559	123.0373	121.4443	121.1257	119.5327	119.5327	119.2141	120.1699	121.1257	121.7629	122.4001 (39)
Average = Sum(39)m / 12 =												121.3647

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0459	1.0432	1.0405	1.0270	1.0243	1.0108	1.0108	1.0082	1.0162	1.0243	1.0297	1.0351 (40)
HLP (average)												1.0263
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8563 (42)
Hot water usage for mixer showers	72.1104	71.0268	69.4476	66.4262	64.1965	61.7100	60.2966	61.8638	63.5817	66.2515	69.3378	71.8342 (42a)
Hot water usage for baths	31.1331	30.6707	30.0196	28.8191	27.9201	26.9233	26.3849	27.0315	27.7354	28.8020	30.0273	31.0278 (42b)
Hot water usage for other uses	43.8813	42.2856	40.6899	39.0942	37.4986	35.9029	35.9029	37.4986	39.0942	40.6899	42.2856	43.8813 (42c)
Average daily hot water use (litres/day)												135.2407 (43)
Daily hot water use	147.1248	143.9831	140.1571	134.3395	129.6152	124.5362	122.5844	126.3938	130.4114	135.7435	141.6507	146.7433 (44)
Energy conte	233.0097	205.0300	215.4163	183.9041	174.4870	153.1317	148.2552	156.5019	160.8103	184.2026	201.8074	229.7645 (45)
Energy content (annual)										Total = Sum(45)m =		2246.3207
Distribution loss (46)m = 0.15 x (45)m	34.9515	30.7545	32.3124	27.5856	26.1730	22.9698	22.2383	23.4753	24.1215	27.6304	30.2711	34.4647 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	283.9686	251.0574	266.3752	233.2192	225.4459	202.4468	199.2141	207.4608	210.1254	235.1615	251.1225	280.7234 (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	283.9686	251.0574	266.3752	233.2192	225.4459	202.4468	199.2141	207.4608	210.1254	235.1615	251.1225	280.7234 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2846.3207 (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	90.2155	79.6793	84.3656	73.4769	70.7566	63.2451	62.0346	64.7766	65.7982	73.9871	79.4297	89.1364 (65)

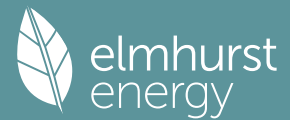
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.6992	157.9884	142.6992	147.4558	142.6992	147.4558	142.6992	142.6992	147.4558	142.6992	147.4558	142.6992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.9171	285.8529	278.4548	262.7051	242.8240	224.1385	211.6554	208.7196	216.1177	231.8674	251.7486	270.4341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815 (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)	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517 (71)
Water heating gains (Table 5)	121.2573	118.5704	113.3947	102.0512	95.1030	87.8404	83.3798	87.0654	91.3864	99.4450	110.3191	119.8070 (72)
Total internal gains	615.7181	631.2561	603.3931	581.0566	549.4706	525.2791	503.5788	504.3286	520.8043	542.8560	578.3679	601.7847 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
-------	------	------------	---	----	--------	-------

Full SAP Calculation Printout



	m2		Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W	
North	1.3700		10.6334		0.5500		0.7000		0.7700		3.8867	(74)
South	7.2500		46.7521		0.5500		0.7000		0.7700		90.4342	(78)
North	36.2400		26.0000		0.5500		0.7000		1.0000		326.4862	(82)
South	0.8000		26.0000		0.5500		0.7000		1.0000		7.2072	(82)

Solar gains	428.0143	848.5912	1433.3834	2158.6580	2713.7067	2809.9451	2661.9214	2239.5517	1688.2077	1015.6579	535.5241	350.9052	(83)
Total gains	1043.7324	1479.8473	2036.7765	2739.7145	3263.1773	3335.2241	3165.5002	2743.8803	2209.0120	1558.5139	1113.8920	952.6899	(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	38.1616	38.2602	38.3592	38.8624	38.9646	39.4839	39.4839	39.5894	39.2745	38.9646	38.7607	38.5589	
alpha	3.5441	3.5507	3.5573	3.5908	3.5976	3.6323	3.6323	3.6393	3.6183	3.5976	3.5840	3.5706	
util living area	0.9539	0.8785	0.7262	0.5082	0.3402	0.2285	0.1659	0.1994	0.3685	0.6928	0.9105	0.9645	(86)
MIT	19.7852	20.1894	20.5915	20.8324	20.8972	20.9122	20.9145	20.9140	20.8988	20.7235	20.1956	19.7108	(87)
Th 2	20.0453	20.0475	20.0497	20.0609	20.0631	20.0743	20.0743	20.0765	20.0698	20.0631	20.0587	20.0542	(88)
util rest of house	0.9459	0.8610	0.6968	0.4739	0.3072	0.1958	0.1311	0.1596	0.3210	0.6503	0.8941	0.9582	(89)
MIT 2	18.6349	19.1315	19.6027	19.8733	19.9390	19.9635	19.9651	19.9672	19.9492	19.7726	19.1574	18.5489	(90)
Living area fraction										FLA = Living area / (4) =		0.2432	(91)
MIT	18.9147	19.3888	19.8431	20.1065	20.1720	20.1942	20.1960	20.1975	20.1801	20.0038	19.4099	18.8315	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7647	19.2388	19.6931	19.9565	20.0220	20.0442	20.0460	20.0475	20.0301	19.8538	19.2599	18.6815	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9325	0.8440	0.6850	0.4700	0.3058	0.1947	0.1301	0.1583	0.3189	0.6401	0.8774	0.9465	(94)
Useful gains	973.2305	1248.9844	1395.1489	1287.7833	997.7901	649.3753	411.6922	434.3832	704.5265	997.6551	977.3755	901.6972	(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	1788.9119	1768.7693	1623.2488	1342.7533	1008.0122	650.7607	411.9096	434.8318	712.6219	1120.8775	1480.6265	1772.5334	(97)
Space heating kWh	606.8669	349.2954	169.7063	39.5784	7.6053	0.0000	0.0000	0.0000	0.0000	91.6775	362.3408	647.9021	(98a)
Space heating requirement - total per year (kWh/year)												2274.9726	
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	606.8669	349.2954	169.7063	39.5784	7.6053	0.0000	0.0000	0.0000	0.0000	91.6775	362.3408	647.9021	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2274.9726	
Space heating per m2										(98c) / (4) =		19.2387	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	606.8669	349.2954	169.7063	39.5784	7.6053	0.0000	0.0000	0.0000	0.0000	91.6775	362.3408	647.9021	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	678.0636	390.2742	189.6160	44.2216	8.4975	0.0000	0.0000	0.0000	0.0000	102.4329	404.8500	723.9130	(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	283.9686	251.0574	266.3752	233.2192	225.4459	202.4468	199.2141	207.4608	210.1254	235.1615	251.1225	280.7234	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	260.3460	229.0838	240.6886	205.4794	194.9575	171.0969	165.6483	174.8625	179.6763	205.8130	225.4831	256.7201	(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	82.1215	74.1742	82.1215	79.4724	82.1215	79.4724	82.1215	82.1215	79.4724	82.1215	79.4724	82.1215	(223)
Lighting	101.7680	81.6420	73.5096	53.8563	41.6001	33.9877	37.9490	49.3276	64.0717	84.0655	94.9518	104.5964	(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												2541.8688	(211)

Full SAP Calculation Printout



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	2509.8556	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)		
mechanical ventilation fans (SFP = 0.8820)	325.9141	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	966.9141	(231)
Electricity for lighting (calculated in Appendix L)	821.3258	(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	6839.9642	(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	2541.8688	0.2100	533.7924 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2509.8556	0.2100	527.0697 (264)
Space and water heating			1060.8621 (265)
Pumps, fans and electric keep-hot	966.9141	0.1387	134.1229 (267)
Energy for lighting	821.3258	0.1443	118.5427 (268)
Total CO2, kg/year			1313.5277 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.1100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2541.8688	1.1300	2872.3117 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2509.8556	1.1300	2836.1368 (278)
Space and water heating			5708.4486 (279)
Pumps, fans and electric keep-hot	966.9141	1.5128	1462.7477 (281)
Energy for lighting	821.3258	1.5338	1259.7769 (282)
Total Primary energy kWh/year			8430.9731 (286)
Dwelling Primary energy Rate (DPER)			71.3000 (287)

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

1. Overall dwelling characteristics

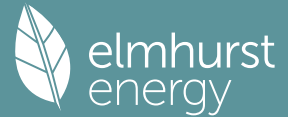
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	48.3600 (1b)	x 2.5000 (2b)	= 120.9000 (1b) - (3b)
First floor	48.3900 (1c)	x 2.6100 (2c)	= 126.2979 (1c) - (3c)
Second floor	21.5000 (1d)	x 2.5900 (2d)	= 55.6850 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	302.8829 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1321 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3821 (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) = 0.3248 (21)

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

Full SAP Calculation Printout



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												
	0.4141	0.4059	0.3978	0.3572	0.3491	0.3085	0.3085	0.3004	0.3248	0.3491	0.3653	0.3816 (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 Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			5.2100	1.1450	5.9656		(27)
TER Roof Light			22.4500	1.5918	45.3952		(27a)
Heatloss Floor 1			48.3600	0.1300	6.2868		(28a)
External Wall 1	59.0200	7.1000	51.9200	0.1800	9.3456		(29a)
pitched roof	45.3900	22.4500	22.9400	0.1100	2.5234		(30)
Roof 2	17.2000		17.2000	0.1100	1.8920		(30)
Total net area of external elements Aum(A, m2)			169.9700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	73.2987		(33)
Main dwelling							
Party Wall 1			116.2800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							143.6839 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	10.3900	0.1600	1.6624
E6 Intermediate floor within a dwelling	10.3900	0.0000	0.0000
R8 Roof to wall (rafter)	20.8000	0.0600	1.2480
R4 Ridge (vaulted ceiling)	5.2000	0.0800	0.4160
E24 Eaves (insulation at ceiling level - inverted)	10.6500	0.2400	2.5560
P5 Party wall - Roof (insulation at rafter level)	17.4600	0.0800	1.3968
P1 Party wall - Ground floor	18.6200	0.0800	1.4896
E18 Party wall between dwellings	22.7000	0.0600	1.3620
P4 Party wall - Roof (insulation at ceiling level)	6.5100	0.1200	0.7812
E2 Other lintels (including other steel lintels)	6.8500	0.0500	0.3425
E3 Sill	5.9500	0.0500	0.2975
E4 Jamb	17.9000	0.0500	0.8950
P2 Party wall - Intermediate floor within a dwelling	27.0300	0.0000	0.0000
R6 Flat ceiling	10.3900	0.0600	0.6234

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

Point Thermal bridges

Total fabric heat loss

(36a) = 13.0704 (36)
(33) + (36) + (36a) = 86.3691 (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	58.5439	58.2112	57.8850	56.3532	56.0666	54.7325	54.7325	54.4854	55.2464	56.0666	56.6464	57.2526 (38)
Heat transfer coeff	144.9129	144.5802	144.2541	142.7223	142.4357	141.1016	141.1016	140.8545	141.6155	142.4357	143.0155	143.6216 (39)
Average = Sum(39)m / 12 =												142.7209

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2255	1.2227	1.2199	1.2070	1.2045	1.1932	1.1932	1.1912	1.1976	1.2045	1.2094	1.2146 (40)
HLP (average)												1.2069
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

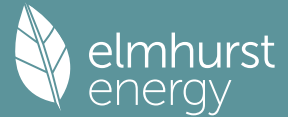
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8563 (42)
Hot water usage for mixer showers													
72.1104	71.0268	69.4476	66.4262	64.1965	61.7100	60.2966	61.8638	63.5817	66.2515	69.3378	71.8342	(42a)	
Hot water usage for baths													
31.1331	30.6707	30.0196	28.8191	27.9201	26.9233	26.3849	27.0315	27.7354	28.8020	30.0273	31.0278	(42b)	
Hot water usage for other uses													
43.8813	42.2856	40.6899	39.0942	37.4986	35.9029	35.9029	37.4986	39.0942	40.6899	42.2856	43.8813	(42c)	
Average daily hot water use (litres/day)												135.2407 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.1248	143.9831	140.1571	134.3395	129.6152	124.5362	122.5844	126.3938	130.4114	135.7435	141.6507	146.7433	(44)	
Energy content (annual)	233.0097	205.0300	215.4163	183.9041	174.4870	153.1317	148.2552	156.5019	160.8103	184.2026	201.8074	229.7645 (45)	
Distribution loss (46)m = 0.15 x (45)m													
34.9515	30.7545	32.3124	27.5856	26.1730	22.9698	22.2383	23.4753	24.1215	27.6304	30.2711	34.4647	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
283.9686	251.0574	266.3752	233.2192	225.4459	202.4468	199.2141	207.4608	210.1254	235.1615	251.1225	280.7234	(62)	
WWHRS	-32.9659	-29.1553	-30.5297	-25.2798	-23.5599	-20.1604	-18.8971	-20.0952	-20.8587	-24.5901	-27.8576	-32.3554 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h													
251.0027	221.9021	235.8454	207.9393	201.8860	182.2864	180.3170	187.3656	189.2667	210.5714	223.2649	248.3680	(64)	
12Total per year (kWh/year)													
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
90.2155	79.6793	84.3656	73.4769	70.7566	63.2451	62.0346	64.7766	65.7982	73.9871	79.4297	89.1364	(65)	

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

Metabolic gains (Table 5), Watts												
(66)m	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146 (66)

Full SAP Calculation Printout



Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
	142.6992	157.9884	142.6992	147.4558	142.6992	147.4558	142.6992	147.4558	142.6992	147.4558	142.6992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
	282.9171	285.8529	278.4548	262.7051	242.8240	224.1385	211.6554	208.7196	216.1177	231.8674	251.7486 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)											
	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517 (71)
Water heating gains (Table 5)											
	121.2573	118.5704	113.3947	102.0512	95.1030	87.8404	83.3798	87.0654	91.3864	99.4450	110.3191 (72)
Total internal gains											
	615.7181	631.2561	603.3931	581.0566	549.4706	525.2791	503.5788	504.3286	520.8043	542.8560	578.3679 (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
North					0.8200	10.6334	0.6300		0.7000		0.7700		2.6648 (74)
South					4.3900	46.7521	0.6300		0.7000		0.7700		62.7245 (78)
North					21.9700	26.0000	0.6300		0.7000		1.0000		226.7172 (82)
South					0.4800	26.0000	0.6300		0.7000		1.0000		4.9533 (82)
Solar gains	297.0598	588.9809	994.9077	1498.3553	1883.6375	1950.4410	1847.6939	1554.5117	1171.7947	704.9489	371.6806	243.5397	(83)
Total gains	912.7778	1220.2370	1598.3007	2079.4119	2433.1080	2475.7201	2351.2727	2058.8402	1692.5990	1247.8049	950.0485	845.3244	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	32.5686	32.6436	32.7174	33.0685	33.1351	33.4484	33.4484	33.5070	33.3270	33.1351	33.0007
alpha	3.1712	3.1762	3.1812	3.2046	3.2090	3.2299	3.2299	3.2338	3.2218	3.2090	3.2000
util living area											
	0.9712	0.9344	0.8516	0.6873	0.5062	0.3557	0.2614	0.3095	0.5312	0.8232	0.9485
											0.9768 (86)
MIT											
	18.9482	19.4100	20.0210	20.5995	20.8749	20.9698	20.9916	20.9856	20.8948	20.3890	19.5397
Th 2											
	19.8997	19.9019	19.9041	19.9144	19.9164	19.9254	19.9254	19.9271	19.9219	19.9164	19.9125
util rest of house											
	0.9656	0.9226	0.8277	0.6471	0.4560	0.2990	0.1987	0.2395	0.4612	0.7853	0.9372
MIT 2											
	17.5318	18.1096	18.8540	19.5239	19.8114	19.9060	19.9218	19.9205	19.8462	19.3172	18.2882
Living area fraction											
	17.8763	18.4259	19.1378	19.7855	20.0701	20.1647	20.1820	20.1795	20.1013	19.5778	18.5926
MIT											
	17.8763	18.4259	19.1378	19.7855	20.0701	20.1647	20.1820	20.1795	20.1013	19.5778	18.5926
Temperature adjustment											
	17.8763	18.4259	19.1378	19.7855	20.0701	20.1647	20.1820	20.1795	20.1013	19.5778	18.5926
adjusted MIT											
	17.8763	18.4259	19.1378	19.7855	20.0701	20.1647	20.1820	20.1795	20.1013	19.5778	18.5926

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9511	0.9023	0.8083	0.6421	0.4633	0.3118	0.2138	0.2562	0.4734	0.7717	0.9189	0.9595 (94)
Useful gains	868.1206	1101.0260	1291.8763	1335.1051	1127.3555	771.9538	502.6563	527.3751	801.2424	962.8952	872.9538	811.0930 (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												
	1967.3848	1955.5759	1823.0580	1553.6083	1192.1974	785.1929	505.4283	532.3653	849.8700	1278.7651	1643.6133	1951.3933 (97)
Space heating kWh												
	817.8525	574.2575	395.1992	157.3223	48.2424	0.0000	0.0000	0.0000	0.0000	235.0071	554.8748	848.3834 (98a)
Space heating requirement - total per year (kWh/year)												
												3631.1394
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												
	817.8525	574.2575	395.1992	157.3223	48.2424	0.0000	0.0000	0.0000	0.0000	235.0071	554.8748	848.3834 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												3631.1394
Space heating per m2												
										(98c) / (4) =		30.7073 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	817.8525	574.2575	395.1992	157.3223	48.2424	0.0000	0.0000	0.0000	0.0000	235.0071	554.8748	848.3834 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	885.1218	621.4908	427.7047	170.2623	52.2104	0.0000	0.0000	0.0000	0.0000	254.3367	600.5139	918.1639 (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	251.0027	221.9021	235.8454	207.9393	201.8860	182.2864	180.3170	187.3656	189.2667	210.5714	223.2649	248.3680 (64)
Efficiency of water heater (217)m	86.7190	86.3233	85.4786	83.7913	81.8267	80.3000	80.3000	80.3000	80.3000	84.6173	86.2497	80.3000 (216)
Fuel for water heating, kWh/month	289.4438	257.0594	275.9118	248.1635	246.7238	227.0068	224.5541	233.3321	235.6995	248.8515	258.8589	286.1549 (219)
Space cooling fuel requirement												

Full SAP Calculation Printout



(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	29.6501	23.7864	21.4170	15.6910	12.1202	9.9023	11.0564	14.3716	18.6673	24.4925	27.6642	30.4741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.5358	-64.3516	-92.7060	-104.4453	-112.7506	-105.2179	-103.8413	-97.9223	-87.5711	-73.5946	-50.0857	-39.3439	(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	-25.2728	-53.2137	-105.8790	-159.2149	-210.7461	-211.8947	-209.4777	-177.3323	-129.8837	-76.2574	-33.7878	-19.9880	(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												3929.8045	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3031.7600	(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)												239.2931	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2390.3142	(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												4896.5434	(238)

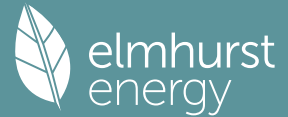
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3929.8045	0.2100	825.2589 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3031.7600	0.2100	636.6696 (264)
Space and water heating			1461.9285 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	239.2931	0.1443	34.5374 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.3661	0.1346	-131.5097
PV Unit electricity exported	-1412.9481	0.1259	-177.8222
Total			-309.3319 (269)
Total CO2, kg/year			1199.0632 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3929.8045	1.1300	4440.6791 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3031.7600	1.1300	3425.8888 (278)
Space and water heating			7866.5679 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	239.2931	1.5338	367.0357 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.3661	1.4973	-1463.4023
PV Unit electricity exported	-1412.9481	0.4620	-652.7259
Total			-2116.1282 (283)
Total Primary energy kWh/year			6247.5763 (286)
Target Primary Energy Rate (TPER)			52.8300 (287)

Full SAP Calculation Printout



Property Reference	Plot 18	Issued on Date	07/11/2025
Assessment Reference	00001	Prop Type Ref	
Property			
SAP Rating	79 C	DER	12.33
Environmental	89 B	% DER < TER	2.99
CO ₂ Emissions (t/year)	1.26	DFEE	46.45
Compliance Check	See BREL	% DFEE < TFEE	9.70
% DPER < TPER	-16.84	DPER	78.13
Assessor Details	Ms. Vanessa Vienna	Assessor ID	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	66.9000 (1b)	x 2.5000 (2b)	= 167.2500 (1b) - (3b)
First floor	59.0000 (1c)	x 3.7900 (2c)	= 223.6100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 390.8600 (5)

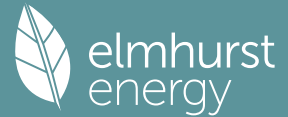
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.1912 0.1875 0.1837 0.1650 0.1612 0.1425 0.1425 0.1388 0.1500 0.1612 0.1687 0.1762 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)
Effective ac	0.2727 0.2690 0.2652 0.2465 0.2427 0.2240 0.2240 0.2202 0.2315 0.2427 0.2502 0.2577 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			17.0800	1.1450	19.5573		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			3.6000	1.1450	4.1221		(27a)
Heatloss Floor 1			66.9000	0.1000	6.6900	110.0000	7359.0000 (28a)
External Wall 1	187.4000	18.9700	168.4300	0.1300	21.8959	190.0000	32001.6988 (29a)
pitched roof	91.9000	3.6000	88.3000	0.1000	8.8300	9.0000	794.7000 (30)
Total net area of external elements Aum(A, m ²)			346.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.3633		(33)
Main dwelling							
Party Floor 1			130.7600			80.0000	10460.8000 (32d)
Internal Wall 1			43.9700			9.0000	395.7300 (32c)
Internal Floor 1			59.0000			18.0000	1062.0000 (32d)
Internal Ceiling 1			59.0000			9.0000	531.0000 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 52604.9289 (34)
417.8310 (35)

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	21.2000	0.0900	1.9080
E5 Ground floor (normal)	38.1300	0.1600	6.1008
E6 Intermediate floor within a dwelling	29.8000	0.0700	2.0860
E13 Gable (insulation at rafter level)	27.0000	0.0400	1.0800
R8 Roof to wall (rafter)	27.4000	0.1200	3.2880
R4 Ridge (vaulted ceiling)	13.7000	0.1200	1.6440
E2 Other lintels (including other steel lintels)	12.4000	0.2000	2.4800
E3 Sill	11.5000	0.0400	0.4600
E4 Jamb	38.3400	0.0500	1.9170
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			20.9638 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	84.3271 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.1803	34.6966	34.2130	31.7945	31.3108	28.8924	28.8924	28.4087	29.8597	31.3108	32.2782	33.2456	(38)
Heat transfer coeff	119.5074	119.0237	118.5400	116.1216	115.6379	113.2195	113.2195	112.7358	114.1868	115.6379	116.6053	117.5727	(39)
Average = Sum(39)m / 12 =												116.0007	
HLP	0.9492	0.9454	0.9415	0.9223	0.9185	0.8993	0.8993	0.8954	0.9070	0.9185	0.9262	0.9339	(40)
HLP (average)												0.9214	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8835 (42)
Hot water usage for mixer showers	72.5668	71.4762	69.8871	66.8466	64.6028	62.1005	60.6782	62.2553	63.9841	66.6708	69.7766	72.2887	(42a)
Hot water usage for baths	31.3293	30.8640	30.2088	29.0007	28.0961	27.0930	26.5512	27.2018	27.9103	28.9836	30.2166	31.2234	(42b)
Hot water usage for other uses	44.1600	42.5542	40.9484	39.3426	37.7367	36.1309	36.1309	37.7367	39.3426	40.9484	42.5542	44.1600	(42c)
Average daily hot water use (litres/day)												136.0968	(43)
Daily hot water use	148.0561	144.8945	141.0443	135.1899	130.4356	125.3244	123.3603	127.1939	131.2369	136.6027	142.5474	147.6721	(44)
Energy conte	234.4847	206.3278	216.7798	185.0682	175.5914	154.1010	149.1936	157.4926	161.8282	185.3686	203.0849	231.2189	(45)
Energy content (annual)										Total = Sum(45)m =		2260.5397	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	35.1727	30.9492	32.5170	27.7602	26.3387	23.1152	22.3790	23.6239	24.2742	27.8053	30.4627	34.6828	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	285.4436	252.3552	267.7387	234.3832	226.5503	203.4161	200.1525	208.4515	211.1433	236.3275	252.3999	282.1778	(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	285.4436	252.3552	267.7387	234.3832	226.5503	203.4161	200.1525	208.4515	211.1433	236.3275	252.3999	282.1778	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2860.5397	(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	90.7059	80.1108	84.8190	73.8639	71.1239	63.5674	62.3466	65.1060	66.1367	74.3748	79.8545	89.6200	(65)

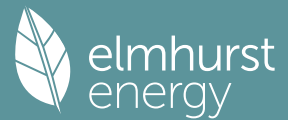
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2499	168.5624	152.2499	157.3249	152.2499	157.3249	152.2499	152.2499	157.3249	152.2499	157.3249	152.2499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	292.7079	295.7453	288.0912	271.7964	251.2272	231.8951	218.9801	215.9427	223.5968	239.8915	260.4607	279.7929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	(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)	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	(71)
Water heating gains (Table 5)	121.9165	119.2126	114.0041	102.5888	95.5966	88.2880	83.7992	87.5081	91.8565	99.9661	110.9090	120.4570	(72)
Total internal gains	636.1270	652.7729	623.5978	600.9628	568.3264	543.7607	521.2818	521.9533	539.0308	561.3602	597.9473	621.7524	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	7.0000	19.6403	0.5500	0.7000	0.7700	36.6808 (76)
South	6.4600	46.7521	0.5500	0.7000	0.7700	80.5800 (78)
West	3.6200	19.6403	0.5500	0.7000	0.7700	18.9692 (80)
North	1.8000	26.0000	0.5500	0.7000	1.0000	16.2162 (82)
South	1.8000	26.0000	0.5500	0.7000	1.0000	16.2162 (82)

Full SAP Calculation Printout



Solar gains	168.6625	308.1922	467.1383	638.5784	757.9327	768.0479	734.2236	644.8949	527.5699	353.8452	206.0681	141.5879 (83)
Total gains	804.7895	960.9651	1090.7361	1239.5412	1326.2591	1311.8086	1255.5055	1166.8483	1066.6007	915.2054	804.0154	763.3403 (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	122.2726	122.7695	123.2704	125.8377	126.3641	129.0633	129.0633	129.6171	127.9699	126.3641	125.3158	124.2847
alpha	9.1515	9.1846	9.2180	9.3892	9.4243	9.6042	9.6042	9.6411	9.5313	9.4243	9.3544	9.2856
util living area	0.9999	0.9991	0.9944	0.9501	0.7869	0.5515	0.3968	0.4443	0.7275	0.9807	0.9993	0.9999 (86)
MIT	20.4569	20.5572	20.6949	20.8693	20.9533	20.9671	20.9675	20.9676	20.9622	20.8360	20.6164	20.4475 (87)
Th 2	20.1259	20.1291	20.1323	20.1486	20.1518	20.1681	20.1681	20.1714	20.1616	20.1518	20.1453	20.1388 (88)
util rest of house	0.9998	0.9986	0.9912	0.9256	0.7255	0.4804	0.3218	0.3644	0.6452	0.9661	0.9988	0.9999 (89)
MIT 2	19.4862	19.6175	19.7953	20.0186	20.1011	20.1263	20.1265	20.1299	20.1174	19.9881	19.7076	19.4855 (90)
Living area fraction	19.6523	19.7784	19.9493	20.1642	20.2469	20.2702	20.2704	20.2733	20.2620	20.1332	19.8632	19.6501 (91)
MIT	19.6523	19.7784	19.9493	20.1642	20.2469	20.2702	20.2704	20.2733	20.2620	20.1332	19.8632	19.6501 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5023	19.6284	19.7993	20.0142	20.0969	20.1202	20.1204	20.1233	20.1120	19.9832	19.7132	19.5001 (93)

8. Space heating requirement

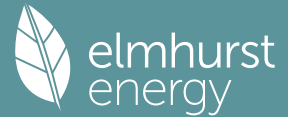
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9997	0.9982	0.9894	0.9209	0.7213	0.4762	0.3175	0.3597	0.6402	0.9621	0.9984	0.9998 (94)
Useful gains	804.5291	959.2245	1079.2017	1141.5390	956.6758	624.7314	398.5759	419.7320	682.7879	880.5274	802.7299	763.1868 (95)
Ext temp.	4.3000	4.9000	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	1816.7926	1753.0270	1576.5012	1290.5977	971.0039	624.9960	398.5804	419.7461	686.4929	1085.0538	1470.7615	1798.8758 (97)
Space heating kWh	753.1240	533.4352	369.9908	107.3222	10.6601	0.0000	0.0000	0.0000	0.0000	152.1677	480.9828	770.5526 (98a)
Space heating requirement - total per year (kWh/year)												3178.2355
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	753.1240	533.4352	369.9908	107.3222	10.6601	0.0000	0.0000	0.0000	0.0000	152.1677	480.9828	770.5526 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3178.2355
Space heating per m2										(98c) / (4) =		25.2441 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	753.1240	533.4352	369.9908	107.3222	10.6601	0.0000	0.0000	0.0000	0.0000	152.1677	480.9828	770.5526 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	841.4794	596.0170	413.3975	119.9131	11.9107	0.0000	0.0000	0.0000	0.0000	170.0197	537.4109	860.9527 (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	285.4436	252.3552	267.7387	234.3832	226.5503	203.4161	200.1525	208.4515	211.1433	236.3275	252.3999	282.1778 (64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	261.9940	230.5338	242.2121	206.7801	196.1915	172.1799	166.6968	175.9694	180.8137	207.1158	226.9105	258.3451 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	91.2957	82.4606	91.2957	88.3506	91.2957	88.3506	91.2957	91.2957	88.3506	91.2957	88.3506	91.2957 (231)
Lighting	108.5792	87.1063	78.4295	57.4608	44.3844	36.2624	40.4889	52.6291	68.3599	89.6919	101.3068	111.5970 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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)	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												3551.1011 (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												2525.7427 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)

Full SAP Calculation Printout



mechanical ventilation fans (SFP = 0.9100)	433.9328 (230a)
central heating pump	41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000 (230f)
Total electricity for the above, kWh/year	1074.9328 (231)
Electricity for lighting (calculated in Appendix L)	876.2964 (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	8028.0729 (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	3551.1011	0.2100	745.7312 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2525.7427	0.2100	530.4060 (264)
Space and water heating			1276.1372 (265)
Pumps, fans and electric keep-hot	1074.9328	0.1387	149.1064 (267)
Energy for lighting	876.2964	0.1443	126.4767 (268)
Total CO2, kg/year			1551.7203 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3551.1011	1.1300	4012.7442 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2525.7427	1.1300	2854.0892 (278)
Space and water heating			6866.8334 (279)
Pumps, fans and electric keep-hot	1074.9328	1.5128	1626.1583 (281)
Energy for lighting	876.2964	1.5338	1344.0927 (282)
Total Primary energy kWh/year			9837.0844 (286)
Dwelling Primary energy Rate (DPER)			78.1300 (287)

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

1. Overall dwelling characteristics

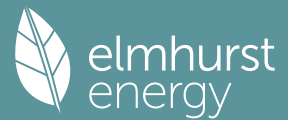
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	66.9000 (1b)	x 2.5000 (2b)	= 167.2500 (1b) - (3b)
First floor	59.0000 (1c)	x 3.7900 (2c)	= 223.6100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 390.8600 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1023 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3523 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3523 (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	0.4492	0.4404	0.4316	0.3876	0.3788	0.3347	0.3347	0.3259	0.3523	0.3788	0.3964	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5786	0.5857 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			17.0800	1.1450	19.5573		(27)
TER Roof Light			3.6000	1.5918	7.2794		(27a)
Heatloss Floor 1			66.9000	0.1300	8.6970		(28a)
External Wall 1	187.4000	18.9700	168.4300	0.1800	30.3174		(29a)
pitched roof	91.9000	3.6000	88.3000	0.1100	9.7130		(30)
Total net area of external elements Aum(A, m2)			346.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.4541		(33)

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

417.8310 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	21.2000	0.0900	1.9080
E5 Ground floor (normal)	38.1300	0.1600	6.1008
E6 Intermediate floor within a dwelling	29.8000	0.0000	0.0000
E13 Gable (insulation at rafter level)	27.0000	0.0800	2.1600
R8 Roof to wall (rafter)	27.4000	0.0600	1.6440
R4 Ridge (vaulted ceiling)	13.7000	0.0800	1.0960
E2 Other lintels (including other steel lintels)	12.4000	0.0500	0.6200
E3 Sill	11.5000	0.0500	0.5750
E4 Jamb	38.3400	0.0500	1.9170
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.0208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	93.4749 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	77.5069	77.0016	76.5062	74.1794	73.7440	71.7175	71.7175	71.3422	72.4981	73.7440	74.6247	75.5454 (38)
Average = Sum(39)m / 12 =	170.9818	170.4764	169.9810	167.6542	167.2189	165.1923	165.1923	164.8170	165.9729	167.2189	168.0996	169.0203 (39)
												167.6522
HLP	1.3581	1.3541	1.3501	1.3316	1.3282	1.3121	1.3121	1.3091	1.3183	1.3282	1.3352	1.3425 (40)
HLP (average)												1.3316
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

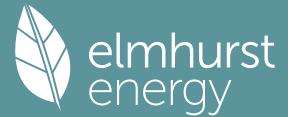
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8835 (42)
Hot water usage for mixer showers	72.5668	71.4762	69.8871	66.8466	64.6028	62.1005	60.6782	62.2553	63.9841	66.6708	69.7766	72.2887 (42a)
Hot water usage for baths	31.3293	30.8640	30.2088	29.0007	28.0961	27.0930	26.5512	27.2018	27.9103	28.9836	30.2166	31.2234 (42b)
Hot water usage for other uses	44.1600	42.5542	40.9484	39.3426	37.7367	36.1309	36.1309	37.7367	39.3426	40.9484	42.5542	44.1600 (42c)
Average daily hot water use (litres/day)												136.0968 (43)
Daily hot water use	148.0561	144.8945	141.0443	135.1899	130.4356	125.3244	123.3603	127.1939	131.2369	136.6027	142.5474	147.6721 (44)
Energy conte	234.4847	206.3278	216.7798	185.0682	175.5914	154.1010	149.1936	157.4926	161.8282	185.3686	203.0849	231.2189 (45)
Energy content (annual)										Total = Sum(45)m =		2260.5397
Distribution loss (46)m = 0.15 x (45)m	35.1727	30.9492	32.5170	27.7602	26.3387	23.1152	22.3790	23.6239	24.2742	27.8053	30.4627	34.6828 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	285.4436	252.3552	267.7387	234.3832	226.5503	203.4161	200.1525	208.4515	211.1433	236.3275	252.3999	282.1778 (62)
WWHRS	-33.1745	-29.3398	-30.7229	-25.4398	-23.7090	-20.2880	-19.0167	-20.2224	-20.9907	-24.7457	-28.0339	-32.5602 (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	252.2691	223.0154	237.0158	208.9434	202.8413	183.1281	181.1358	188.2291	190.1526	211.5818	224.3660	249.6176 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2552.2961 (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	90.7059	80.1108	84.8190	73.8639	71.1239	63.5674	62.3466	65.1060	66.1367	74.3748	79.8545	89.6200 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2499	168.5624	152.2499	157.3249	152.2499	157.3249	152.2499	152.2499	157.3249	152.2499	157.3249	152.2499 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	292.7079	295.7453	288.0912	271.7964	251.2272	231.8951	218.9801	215.9427	223.5968	239.8915	260.4607	279.7929 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175 (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)	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403 (71)
Water heating gains (Table 5)	121.9165	119.2126	114.0041	102.5888	95.5966	88.2880	83.7992	87.5081	91.8565	99.9661	110.9090	120.4570 (72)
Total internal gains	636.1270	652.7729	623.5978	600.9628	568.3264	543.7607	521.2818	521.9533	539.0308	561.3602	597.9473	621.7524 (73)

Full SAP Calculation Printout



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
East	7.0000				19.6403	0.6300		0.7000		0.7700		42.0162 (76)
South	6.4600				46.7521	0.6300		0.7000		0.7700		92.3007 (78)
West	3.6200				19.6403	0.6300		0.7000		0.7700		21.7284 (80)
North	1.8000				26.0000	0.6300		0.7000		1.0000		18.5749 (82)
South	1.8000				26.0000	0.6300		0.7000		1.0000		18.5749 (82)
Solar gains	193.1952	353.0202	535.0857	731.4626	868.1775	879.7640	841.0198	738.6978	604.3073	405.3136	236.0416	162.1825 (83)
Total gains	829.3222	1005.7931	1158.6835	1332.4253	1436.5039	1423.5247	1362.3016	1260.6512	1143.3382	966.6738	833.9889	783.9349 (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	85.4622	85.7156	85.9654	87.1584	87.3853	88.4574	88.4574	88.6588	88.0413	87.3853	86.9275	86.4540
alpha	6.6975	6.7144	6.7310	6.8106	6.8257	6.8972	6.8972	6.9106	6.8694	6.8257	6.7952	6.7636
util living area	0.9998	0.9993	0.9967	0.9796	0.9041	0.7155	0.5303	0.5941	0.8736	0.9919	0.9994	0.9999 (86)
MIT	19.9002	20.0553	20.2883	20.6062	20.8603	20.9789	20.9976	20.9950	20.9202	20.5750	20.1819	19.8821 (87)
Th 2	19.7956	19.7987	19.8018	19.8161	19.8188	19.8314	19.8314	19.8337	19.8265	19.8188	19.8134	19.8077 (88)
util rest of house	0.9997	0.9988	0.9946	0.9658	0.8463	0.5993	0.3915	0.4479	0.7799	0.9842	0.9990	0.9998 (89)
MIT 2	18.5277	18.7289	19.0288	19.4366	19.7196	19.8236	19.8310	19.8328	19.7854	19.4063	18.9027	18.5138 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7626	18.9559	19.2444	19.6368	19.9149	20.0214	20.0307	20.0318	19.9796	19.6063	19.1217	18.7481 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7626	18.9559	19.2444	19.6368	19.9149	20.0214	20.0307	20.0318	19.9796	19.6063	19.1217	18.7481 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9996	0.9983	0.9931	0.9630	0.8519	0.6193	0.4154	0.4734	0.7944	0.9821	0.9986	0.9997 (94)
Useful gains	828.9561	1004.0742	1150.6334	1283.1029	1223.7453	881.6208	565.9422	596.7432	908.2705	949.3461	832.7905	783.7006 (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	2472.8434	2396.2003	2166.3118	1800.0659	1373.6811	895.5681	566.7240	598.5765	975.8594	1506.0314	2020.8387	2458.9163 (97)
Space heating kWh	1223.0522	935.5088	755.6648	372.2133	111.5522	0.0000	0.0000	0.0000	0.0000	414.1738	855.3947	1246.3605 (98a)
Space heating requirement - total per year (kWh/year)	5913.9203											
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	1223.0522	935.5088	755.6648	372.2133	111.5522	0.0000	0.0000	0.0000	0.0000	414.1738	855.3947	1246.3605 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5913.9203											
Space heating per m2	(98c) / (4) = 46.9732 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1223.0522	935.5088	755.6648	372.2133	111.5522	0.0000	0.0000	0.0000	0.0000	414.1738	855.3947	1246.3605 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	1323.6496	1012.4554	817.8190	402.8283	120.7275	0.0000	0.0000	0.0000	0.0000	448.2401	925.7518	1348.8750 (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	252.2691	223.0154	237.0158	208.9434	202.8413	183.1281	181.1358	188.2291	190.1526	211.5818	224.3660	249.6176 (64)
Efficiency of water heater (217)m	87.3012	87.1042	86.6834	85.6038	83.1542	80.3000	80.3000	80.3000	80.3000	85.7932	86.9647	80.3000 (216)
Fuel for water heating, kWh/month	288.9639	256.0328	273.4269	244.0819	243.9339	228.0550	225.5739	234.4074	236.8027	246.6183	257.9968	285.8025 (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	31.6345	25.3784	22.8504	16.7412	12.9314	10.5651	11.7964	15.3335	19.9167	26.1317	29.5157	32.5138 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-58.7013	-80.8397	-113.5090	-124.5261	-131.6530	-121.8635	-120.2483	-114.7217	-104.6944	-90.8539	-63.8053	-50.9695 (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	-39.2535	-81.7972	-161.2085	-240.2147	-315.8641	-316.8221	-313.1893	-266.0585	-196.1271	-116.4476	-52.2231	-31.1088 (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)												

Full SAP Calculation Printout



(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												6400.3466	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3021.6959	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												255.3088	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3306.7002	(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												6456.6511	(238)

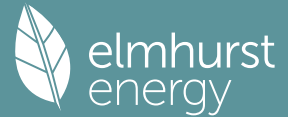
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6400.3466	0.2100	1344.0728	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3021.6959	0.2100	634.5561	(264)
Space and water heating			1978.6289	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	255.3088	0.1443	36.8489	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1176.3858	0.1351	-158.9465	
PV Unit electricity exported	-2130.3144	0.1261	-268.6838	
Total			-427.6303	(269)
Total CO2, kg/year			1599.7768	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7100	(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	6400.3466	1.1300	7232.3917	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3021.6959	1.1300	3414.5163	(278)
Space and water heating			10646.9080	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	255.3088	1.5338	391.6012	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1176.3858	1.4994	-1763.8596	
PV Unit electricity exported	-2130.3144	0.4630	-986.2752	
Total			-2750.1349	(283)
Total Primary energy kWh/year			8418.4751	(286)
Target Primary Energy Rate (TPER)			66.8700	(287)

Full SAP Calculation Printout



Property Reference	Plot 17	Issued on Date	07/11/2025
Assessment Reference	00001	Prop Type Ref	
Property			
SAP Rating	79 C	DER	12.37
Environmental	89 B	% DER < TER	4.33
CO ₂ Emissions (t/year)	1.27	DFEE	46.61
Compliance Check	See BREL	% DFEE < TFEE	10.57
% DPER < TPER	-15.35	DPER	78.56
Assessor Details	Ms. Vanessa Vienna	Assessor ID	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	66.9200 (1b)	x 2.5000 (2b)	= 167.3000 (1b) - (3b)
First floor	59.0000 (1c)	x 3.7900 (2c)	= 223.6100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 390.9100 (5)

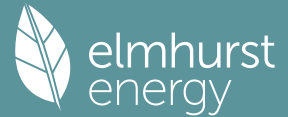
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.1912 0.1875 0.1837 0.1650 0.1612 0.1425 0.1425 0.1388 0.1500 0.1612 0.1687 0.1762 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)
Effective ac	0.2727 0.2690 0.2652 0.2465 0.2427 0.2240 0.2240 0.2202 0.2315 0.2427 0.2502 0.2577 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			13.5600	1.1450	15.5267		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			3.6000	1.1450	4.1221		(27a)
Heatloss Floor 1			66.9000	0.1000	6.6900	110.0000	7359.0000 (28a)
External Wall 1	187.4000	15.4500	171.9500	0.1300	22.3535	190.0000	32670.4988 (29a)
pitched roof	105.7300	3.6000	102.1300	0.1000	10.2130	9.0000	919.1700 (30)
Total net area of external elements Aum(A, m ²)			360.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.1734		(33)
Main dwelling							
Party Floor 1			130.7600			80.0000	10460.8000 (32d)
Internal Wall 1			43.9700			9.0000	395.7300 (32c)
Internal Floor 1			59.0000			18.0000	1062.0000 (32d)
Internal Ceiling 1			59.0000			9.0000	531.0000 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 53398.1989 (34)
424.0645 (35)

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	21.2000	0.0900	1.9080
E5 Ground floor (normal)	38.1300	0.1600	6.1008
E6 Intermediate floor within a dwelling	29.8000	0.0700	2.0860
E13 Gable (insulation at rafter level)	27.0000	0.0400	1.0800
R8 Roof to wall (rafter)	27.4000	0.1200	3.2880
R4 Ridge (vaulted ceiling)	13.7000	0.1200	1.6440
E2 Other lintels (including other steel lintels)	10.3500	0.2000	2.0700
E3 Sill	9.4500	0.0400	0.3780
E4 Jamb	32.3000	0.0500	1.6150
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			20.1698 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	81.3432 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.1848	34.7011	34.2173	31.7986	31.3148	28.8961	28.8961	28.4123	29.8636	31.3148	32.2823	33.2498	(38)
Heat transfer coeff	116.5280	116.0442	115.5605	113.1417	112.6580	110.2392	110.2392	109.7555	111.2067	112.6580	113.6255	114.5930	(39)
Average = Sum(39)m / 12 =												113.0208	
HLP	0.9254	0.9216	0.9177	0.8985	0.8947	0.8755	0.8755	0.8716	0.8832	0.8947	0.9024	0.9100	(40)
HLP (average)												0.8976	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8836 (42)
Hot water usage for mixer showers	72.5678	71.4772	69.8881	66.8475	64.6037	62.1014	60.6791	62.2562	63.9850	66.6717	69.7776	72.2898	(42a)
Hot water usage for baths	31.3297	30.8645	30.2092	29.0011	28.0965	27.0934	26.5516	27.2022	27.9107	28.9840	30.2170	31.2238	(42b)
Hot water usage for other uses	44.1606	42.5548	40.9489	39.3431	37.7373	36.1314	36.1314	37.7373	39.3431	40.9489	42.5548	44.1606	(42c)
Average daily hot water use (litres/day)												136.0987	(43)
Daily hot water use	148.0582	144.8965	141.0463	135.1918	130.4374	125.3262	123.3621	127.1957	131.2387	136.6047	142.5494	147.6742	(44)
Energy conte	234.4879	206.3307	216.7829	185.0708	175.5939	154.1032	149.1957	157.4948	161.8305	185.3712	203.0877	231.2221	(45)
Energy content (annual)										Total = Sum(45)m =		2260.5713	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	35.1732	30.9496	32.5174	27.7606	26.3391	23.1155	22.3794	23.6242	24.2746	27.8057	30.4632	34.6833	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	285.4468	252.3581	267.7418	234.3858	226.5528	203.4182	200.1546	208.4537	211.1456	236.3301	252.4028	282.1810	(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	285.4468	252.3581	267.7418	234.3858	226.5528	203.4182	200.1546	208.4537	211.1456	236.3301	252.4028	282.1810	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2860.5713	(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	90.7070	80.1118	84.8200	73.8648	71.1247	63.5681	62.3473	65.1067	66.1374	74.3757	79.8554	89.6211	(65)

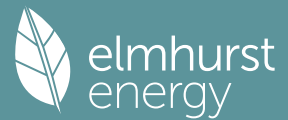
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.8827	174.7988	157.8827	163.1455	157.8827	163.1455	157.8827	157.8827	163.1455	157.8827	163.1455	157.8827	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	292.7327	295.7704	288.1156	271.8195	251.2485	231.9148	218.9986	215.9610	223.6158	239.9119	260.4828	279.8166	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	(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)	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	(71)
Water heating gains (Table 5)	121.9180	119.2140	114.0054	102.5900	95.5977	88.2890	83.8001	87.5091	91.8575	99.9673	110.9103	120.4584	(72)
Total internal gains	641.7869	659.0366	629.2573	606.8085	573.9825	549.6028	526.9350	527.6063	544.8723	567.0154	603.7921	627.4113	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.6800	10.6334	0.5500	0.7000	0.7700	1.9292 (74)
East	3.5000	19.6403	0.5500	0.7000	0.7700	18.3404 (76)
South	5.7800	46.7521	0.5500	0.7000	0.7700	72.0979 (78)
West	3.6000	19.6403	0.5500	0.7000	0.7700	18.8644 (80)
North	1.8000	26.0000	0.5500	0.7000	1.0000	16.2162 (82)
South	1.8000	26.0000	0.5500	0.7000	1.0000	16.2162 (82)

Full SAP Calculation Printout



Solar gains	143.6643	261.9047	396.2845	541.9765	644.4360	653.7768	624.6638	547.6979	447.5057	300.4353	175.3948	120.6984 (83)
Total gains	785.4513	920.9414	1025.5418	1148.7850	1218.4185	1203.3796	1151.5989	1075.3043	992.3780	867.4507	779.1869	748.1096 (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	127.2899	127.8205	128.3556	131.0996	131.6625	134.5513	134.5513	135.1444	133.3807	131.6625	130.5414	129.4393
alpha	9.4860	9.5214	9.5570	9.7400	9.7775	9.9701	9.9701	10.0096	9.8920	9.7775	9.7028	9.6293
util living area	0.9999	0.9994	0.9964	0.9656	0.8256	0.5851	0.4212	0.4694	0.7586	0.9857	0.9995	0.9999 (86)
MIT	20.4762	20.5661	20.6906	20.8578	20.9504	20.9681	20.9687	20.9688	20.9623	20.8337	20.6283	20.4688 (87)
Th 2	20.1460	20.1492	20.1525	20.1688	20.1720	20.1884	20.1884	20.1917	20.1818	20.1720	20.1655	20.1590 (88)
util rest of house	0.9998	0.9990	0.9942	0.9467	0.7665	0.5116	0.3435	0.3870	0.6766	0.9742	0.9991	0.9999 (89)
MIT 2	19.5278	19.6459	19.8074	20.0257	20.1200	20.1481	20.1483	20.1517	20.1387	20.0040	19.7400	19.5298 (90)
Living area fraction									fLA = Living area / (4) =			0.1711 (91)
MIT	19.6901	19.8034	19.9586	20.1681	20.2621	20.2884	20.2887	20.2915	20.2797	20.1460	19.8920	19.6905 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5401	19.6534	19.8086	20.0181	20.1121	20.1384	20.1387	20.1415	20.1297	19.9960	19.7420	19.5405 (93)

8. Space heating requirement

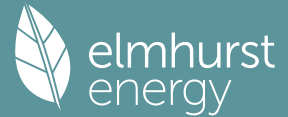
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9998	0.9987	0.9930	0.9424	0.7619	0.5071	0.3387	0.3819	0.6711	0.9708	0.9988	0.9998 (94)
Useful gains	785.2604	919.7782	1018.3346	1082.6572	928.3532	610.2026	390.0957	410.6375	665.9745	842.1328	778.2425	747.9947 (95)
Ext temp.	4.3000	4.9000	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	1775.9024	1712.0457	1537.9462	1257.9182	947.6878	610.5497	390.1010	410.6541	670.5385	1058.5374	1436.4518	1757.9098 (97)
Space heating kWh	737.0377	532.4038	386.5911	126.1879	14.3849	0.0000	0.0000	0.0000	0.0000	161.0051	473.9107	751.3768 (98a)
Space heating requirement - total per year (kWh/year)												3182.8979
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	737.0377	532.4038	386.5911	126.1879	14.3849	0.0000	0.0000	0.0000	0.0000	161.0051	473.9107	751.3768 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3182.8979
Space heating per m2										(98c) / (4) =		25.2771 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	737.0377	532.4038	386.5911	126.1879	14.3849	0.0000	0.0000	0.0000	0.0000	161.0051	473.9107	751.3768 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	823.5058	594.8646	431.9453	140.9920	16.0725	0.0000	0.0000	0.0000	0.0000	179.8939	529.5092	839.5272 (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	285.4468	252.3581	267.7418	234.3858	226.5528	203.4182	200.1546	208.4537	211.1456	236.3301	252.4028	282.1810 (64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	261.9977	230.5370	242.2155	206.7830	196.1943	172.1823	166.6991	175.9718	180.8162	207.1187	226.9136	258.3487 (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	91.3004	82.4649	91.3004	88.3552	91.3004	88.3552	91.3004	91.3004	88.3552	91.3004	88.3552	91.3004 (231)
Lighting	112.5963	90.3289	81.3312	59.5867	46.0265	37.6040	41.9869	54.5762	70.8891	93.0103	105.0549	115.7257 (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												3556.3105 (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												2525.7780 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

Full SAP Calculation Printout



(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)	
mechanical ventilation fans (SFP = 0.9100)	433.9883 (230a)
central heating pump	41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000 (230f)
Total electricity for the above, kWh/year	1074.9883 (231)
Electricity for lighting (calculated in Appendix L)	908.7168 (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	8065.7935 (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	3556.3105	0.2100	746.8252 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2525.7780	0.2100	530.4134 (264)
Space and water heating			1277.2386 (265)
Pumps, fans and electric keep-hot	1074.9883	0.1387	149.1141 (267)
Energy for lighting	908.7168	0.1443	131.1559 (268)
Total CO2, kg/year			1557.5086 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3700 (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	3556.3105	1.1300	4018.6308 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2525.7780	1.1300	2854.1291 (278)
Space and water heating			6872.7600 (279)
Pumps, fans and electric keep-hot	1074.9883	1.5128	1626.2423 (281)
Energy for lighting	908.7168	1.5338	1393.8201 (282)
Total Primary energy kWh/year			9892.8224 (286)
Dwelling Primary energy Rate (DPER)			78.5600 (287)

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

1. Overall dwelling characteristics

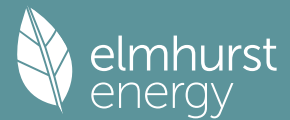
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	66.9200 (1b)	x 2.5000 (2b)	= 167.3000 (1b) - (3b)
First floor	59.0000 (1c)	x 3.7900 (2c)	= 223.6100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	390.9100 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1023 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3523 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3523 (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	0.4492	0.4404	0.4316	0.3876	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3964	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5786	0.5857 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			13.5600	1.1450	15.5267			(27)
TER Roof Light			3.6000	1.5918	7.2794			(27a)
Heatloss Floor 1			66.9000	0.1300	8.6970			(28a)
External Wall 1	187.4000	15.4500	171.9500	0.1800	30.9510			(29a)
pitched roof	105.7300	3.6000	102.1300	0.1100	11.2343			(30)
Total net area of external elements Aum(A, m2)			360.0300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	75.5784		(33)

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

424.0645 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	21.2000	0.0900	1.9080	
E5 Ground floor (normal)	38.1300	0.1600	6.1008	
E6 Intermediate floor within a dwelling	29.8000	0.0000	0.0000	
E13 Gable (insulation at rafter level)	27.0000	0.0800	2.1600	
R8 Roof to wall (rafter)	27.4000	0.0600	1.6440	
R4 Ridge (vaulted ceiling)	13.7000	0.0800	1.0960	
E2 Other lintels (including other steel lintels)	10.3500	0.0500	0.5175	
E3 Sill	9.4500	0.0500	0.4725	
E4 Jamb	32.3000	0.0500	1.6150	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				15.5138 (36)
Point Thermal bridges				0.0000 (36a) =
Total fabric heat loss				(33) + (36) + (36a) = 91.0922 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	77.5159	77.0105	76.5151	74.1881	73.7528	71.7261	71.7261	71.3508	72.5068	73.7528	74.6335	75.5543	(38)
Average = Sum(39)m / 12 =	168.6081	168.1027	167.6073	165.2804	164.8450	162.8183	162.8183	162.4430	163.5990	164.8450	165.7257	166.6465	(39)
												165.2783	
HLP	1.3390	1.3350	1.3311	1.3126	1.3091	1.2930	1.2930	1.2900	1.2992	1.3091	1.3161	1.3234	(40)
HLP (average)												1.3126	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

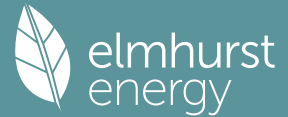
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8836 (42)
Hot water usage for mixer showers	72.5678	71.4772	69.8881	66.8475	64.6037	62.1014	60.6791	62.2562	63.9850	66.6717	69.7776	72.2898	(42a)
Hot water usage for baths	31.3297	30.8645	30.2092	29.0011	28.0965	27.0934	26.5516	27.2022	27.9107	28.9840	30.2170	31.2238	(42b)
Hot water usage for other uses	44.1606	42.5548	40.9489	39.3431	37.7373	36.1314	36.1314	37.7373	39.3431	40.9489	42.5548	44.1606	(42c)
Average daily hot water use (litres/day)												136.0987	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.0582	144.8965	141.0463	135.1918	130.4374	125.3262	123.3621	127.1957	131.2387	136.6047	142.5494	147.6742	(44)
Energy content (annual)	234.4879	206.3307	216.7829	185.0708	175.5939	154.1032	149.1957	157.4948	161.8305	185.3712	203.0877	231.2221	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2260.5713	
	35.1732	30.9496	32.5174	27.7606	26.3391	23.1155	22.3794	23.6242	24.2746	27.8057	30.4632	34.6833	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	285.4468	252.3581	267.7418	234.3858	226.5528	203.4182	200.1546	208.4537	211.1456	236.3301	252.4028	282.1810	(62)
WWHRS	-33.1750	-29.3402	-30.7234	-25.4402	-23.7093	-20.2882	-19.0170	-20.2227	-20.9910	-24.7461	-28.0343	-32.5606	(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	252.2719	223.0178	237.0184	208.9456	202.8434	183.1300	181.1376	188.2310	190.1546	211.5841	224.3685	249.6204	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2552.3234	(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	90.7070	80.1118	84.8200	73.8648	71.1247	63.5681	62.3473	65.1067	66.1374	74.3757	79.8554	89.6211	(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	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.8827	174.7988	157.8827	163.1455	157.8827	163.1455	157.8827	157.8827	163.1455	157.8827	163.1455	157.8827	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	292.7327	295.7704	288.1156	271.8195	251.2485	231.9148	218.9986	215.9610	223.6158	239.9119	260.4828	279.8166	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	(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)	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	(71)
Water heating gains (Table 5)	121.9180	119.2140	114.0054	102.5900	95.5977	88.2890	83.8001	87.5091	91.8575	99.9673	110.9103	120.4584	(72)
Total internal gains	641.7869	659.0366	629.2573	606.8085	573.9825	549.6028	526.9350	527.6063	544.8723	567.0154	603.7921	627.4113	(73)

Full SAP Calculation Printout



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	
North	0.6800		10.6334		0.6300		0.7000		0.7700		2.2098 (74)	
East	3.5000		19.6403		0.6300		0.7000		0.7700		21.0081 (76)	
South	5.7800		46.7521		0.6300		0.7000		0.7700		82.5849 (78)	
West	3.6000		19.6403		0.6300		0.7000		0.7700		21.6084 (80)	
North	1.8000		26.0000		0.6300		0.7000		1.0000		18.5749 (82)	
South	1.8000		26.0000		0.6300		0.7000		1.0000		18.5749 (82)	
Solar gains	164.5610	300.0000	453.9259	620.8094	738.1722	748.8716	715.5240	627.3631	512.5974	344.1350	200.9067	138.2545 (83)
Total gains	806.3479	959.0366	1083.1832	1227.6179	1312.1547	1298.4744	1242.4591	1154.9694	1057.4697	911.1504	804.6989	765.6658 (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	87.9722	88.2367	88.4975	89.7435	89.9805	91.1005	91.1005	91.3110	90.6658	89.9805	89.5023	89.0078
alpha	6.8648	6.8824	6.8998	6.9829	6.9987	7.0734	7.0734	7.0874	7.0444	6.9987	6.9668	6.9339
util living area	0.9999	0.9995	0.9979	0.9869	0.9319	0.7623	0.5716	0.6362	0.9023	0.9943	0.9996	0.9999 (86)
MIT	19.9206	20.0607	20.2745	20.5753	20.8328	20.9718	20.9966	20.9933	20.9058	20.5643	20.1926	19.9054 (87)
Th 2	19.8104	19.8135	19.8166	19.8310	19.8337	19.8463	19.8463	19.8486	19.8414	19.8337	19.8282	19.8225 (88)
util rest of house	0.9998	0.9992	0.9965	0.9774	0.8842	0.6458	0.4248	0.4836	0.8181	0.9888	0.9992	0.9999 (89)
MIT 2	18.5635	18.7455	19.0214	19.4115	19.7088	19.8355	19.8458	19.8474	19.7901	19.4040	18.9261	18.5534 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7958	18.9706	19.2359	19.6106	19.9012	20.0299	20.0428	20.0435	19.9810	19.6026	19.1429	18.7848 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7958	18.9706	19.2359	19.6106	19.9012	20.0299	20.0428	20.0435	19.9810	19.6026	19.1429	18.7848 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9997	0.9988	0.9954	0.9749	0.8876	0.6659	0.4503	0.5103	0.8306	0.9870	0.9989	0.9998 (94)
Useful gains	806.0808	957.8935	1078.2128	1196.7526	1164.7274	864.6107	559.4373	589.3314	878.3848	899.3369	803.8409	765.4914 (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	2444.1019	2365.3036	2134.6236	1770.2568	1351.9200	884.0920	560.5431	591.8689	962.1327	1484.0318	1995.8152	2430.5104 (97)
Space heating kWh	1218.6877	945.7796	785.9696	412.9230	139.2713	0.0000	0.0000	0.0000	0.0000	435.0130	858.2215	1238.7741 (98a)
Space heating requirement - total per year (kWh/year)	6034.6398											
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	1218.6877	945.7796	785.9696	412.9230	139.2713	0.0000	0.0000	0.0000	0.0000	435.0130	858.2215	1238.7741 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6034.6398											
Space heating per m2	(98c) / (4) = 47.9244 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1218.6877	945.7796	785.9696	412.9230	139.2713	0.0000	0.0000	0.0000	0.0000	435.0130	858.2215	1238.7741 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	1318.9260	1023.5710	850.6165	446.8864	150.7265	0.0000	0.0000	0.0000	0.0000	470.7933	928.8111	1340.6646 (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 requirement	252.2719	223.0178	237.0184	208.9456	202.8434	183.1300	181.1376	188.2310	190.1546	211.5841	224.3685	249.6204 (64)
Efficiency of water heater (217)m	87.2966	87.1197	86.7475	85.8121	83.5919	80.3000	80.3000	80.3000	80.3000	85.8899	86.9696	80.3000 (216)
Fuel for water heating, kWh/month	288.9826	255.9902	273.2280	243.4921	242.6591	228.0573	225.5761	234.4098	236.8052	246.3432	257.9850	285.8313 (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	32.8049	26.3173	23.6958	17.3606	13.4098	10.9559	12.2329	15.9008	20.6535	27.0985	30.6077	33.7167 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-58.7623	-80.9358	-113.6489	-124.6748	-131.7978	-121.9914	-120.3889	-114.8819	-104.8586	-90.9885	-63.8835	-51.0223 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-39.2218	-81.7497	-161.1508	-240.1751	-315.8531	-316.8252	-313.1783	-266.0120	-196.0528	-116.3750	-52.1796	-31.0805 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(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												6530.9955	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3019.3599	(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)												264.7545	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3307.6886	(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												6593.4212	(238)

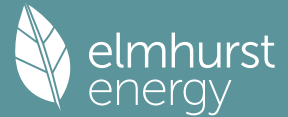
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6530.9955	0.2100	1371.5091	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3019.3599	0.2100	634.0656	(264)
Space and water heating			2005.5746	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.7545	0.1443	38.2123	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1177.8346	0.1351	-159.1412	
PV Unit electricity exported	-2129.8540	0.1261	-268.6149	
Total			-427.7561	(269)
Total CO2, kg/year			1627.9600	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.9300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	6530.9955	1.1300	7380.0249	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3019.3599	1.1300	3411.8766	(278)
Space and water heating			10791.9016	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.7545	1.5338	406.0892	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1177.8346	1.4994	-1766.0282	
PV Unit electricity exported	-2129.8540	0.4630	-986.0218	
Total			-2752.0500	(283)
Total Primary energy kWh/year			8576.0416	(286)
Target Primary Energy Rate (TPER)			68.1100	(287)

Full SAP Calculation Printout



Property Reference	Plot 9,10				Issued on Date	07/11/2025
Assessment Reference	00001		Prop Type Ref			
Property						
SAP Rating	80 C	DER	11.19	TER	11.15	
Environmental	90 B	% DER < TER				-0.36
CO ₂ Emissions (t/year)	1.13	DFEE	41.01	TFEE	43.31	
Compliance Check	See BREL	% DFEE < TFEE				5.30
% DPER < TPER	-23.14	DPER	71.75	TPER	58.27	
Assessor Details	Ms. Vanessa Vienna				Assessor ID	T798-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	48.3600 (1b)	x 2.5000 (2b)	= 120.9000 (1b) - (3b)
First floor	48.3900 (1c)	x 2.6100 (2c)	= 126.2979 (1c) - (3c)
Second floor	21.5000 (1d)	x 2.5900 (2d)	= 55.6850 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 302.8829 (5)

2. Ventilation rate

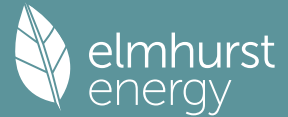
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2719	0.2684	0.2650	0.2476	0.2442	0.2268	0.2268	0.2233	0.2337	0.2442	0.2511	0.2580 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			8.1500	1.1450	9.3321		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			37.0400	1.1450	42.4122		(27a)
Heatloss Floor 1			48.3600	0.1000	4.8360	110.0000	5319.6000 (28a)
External Wall 1	112.7000	10.0400	102.6600	0.1300	13.3458	190.0000	19505.3994 (29a)
pitched roof	45.3900	36.2400	9.1500	0.1000	0.9150	9.0000	82.3500 (30)
Roof 2	17.2000	0.8000	16.4000	0.1000	1.6400	9.0000	147.6000 (30)
Total net area of external elements A _{um} (A, m ²)			223.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.7491		(33)
Main dwelling							
Party Wall 1			58.1000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall 1			34.8700			9.0000	313.8300 (32c)
Internal Floor 1			48.3600			18.0000	870.4800 (32d)

Full SAP Calculation Printout



Internal Floor 2	21.5200	18.0000	387.3600 (32d)
Internal Ceiling 1	48.3000	9.0000	434.7000 (32e)
Internal Ceiling 2	21.0700	9.0000	189.6300 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 27250.9494 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 230.4520 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	19.7000	0.1600	3.1520
E6 Intermediate floor within a dwelling	19.7000	0.0700	1.3790
R8 Roof to wall (rafter)	24.8300	0.1200	2.9796
R4 Ridge (vaulted ceiling)	10.3000	0.1200	1.2360
E24 Eaves (insulation at ceiling level - inverted)	10.6500	0.1500	1.5975
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.4800	4.1760
P1 Party wall - Ground floor	18.6000	0.3200	5.9520
E18 Party wall between dwellings	11.3000	0.0600	0.6780
P4 Party wall - Roof (insulation at ceiling level)	3.3800	0.4800	1.6224
P2 Party wall - Intermediate floor within a dwelling	17.7300	0.0000	0.0000
E16 Corner (normal)	11.3000	0.0900	1.0170
E12 Gable (insulation at ceiling level)	3.1000	0.2500	0.7750
E13 Gable (insulation at rafter level)	2.7900	0.0400	0.1116
E2 Other lintels (including other steel lintels)	5.1000	0.2000	1.0200
E3 Sill	4.2000	0.0400	0.1680
E4 Jamb	15.9000	0.0500	0.7950

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.6591 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 101.4082 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.1774	26.8307	26.4840	24.7505	24.4037	22.6702	22.6702	22.3235	23.3636	24.4037	25.0972	25.7906 (38)
Heat transfer coeff	128.5856	128.2389	127.8922	126.1586	125.8119	124.0784	124.0784	123.7317	124.7718	125.8119	126.5053	127.1987 (39)
Average = Sum(39)m / 12 =												126.0720

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0874	1.0845	1.0815	1.0669	1.0639	1.0493	1.0493	1.0464	1.0552	1.0639	1.0698	1.0757 (40)
HLP (average)												1.0661
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8563 (42)
Hot water usage for mixer showers												
72.1104	71.0268	69.4476	66.4262	64.1965	61.7100	60.2966	61.8638	63.5817	66.2515	69.3378	71.8342 (42a)	
Hot water usage for baths												
31.1331	30.6707	30.0196	28.8191	27.9201	26.9233	26.3849	27.0315	27.7354	28.8020	30.0273	31.0278 (42b)	
Hot water usage for other uses												
43.8813	42.2856	40.6899	39.0942	37.4986	35.9029	35.9029	37.4986	39.0942	40.6899	42.2856	43.8813 (42c)	
Average daily hot water use (litres/day)												135.2407 (43)

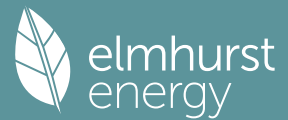
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.1248	143.9831	140.1571	134.3395	129.6152	124.5362	122.5844	126.3938	130.4114	135.7435	141.6507	146.7433 (44)
Energy content (annual)	233.0097	205.0300	215.4163	183.9041	174.4870	153.1317	148.2552	156.5019	160.8103	184.2026	201.8074	229.7645 (45)
Distribution loss (46)m = 0.15 x (45)m	34.9515	30.7545	32.3124	27.5856	26.1730	22.9698	22.2383	23.4753	24.1215	27.6304	30.2711	34.4647 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	283.9686	251.0574	266.3752	233.2192	225.4459	202.4468	199.2141	207.4608	210.1254	235.1615	251.1225	280.7234 (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	283.9686	251.0574	266.3752	233.2192	225.4459	202.4468	199.2141	207.4608	210.1254	235.1615	251.1225	280.7234 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2846.3207 (64)
	2846 (64)											

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	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.6992	157.9884	142.6992	147.4558	142.6992	147.4558	142.6992	142.6992	147.4558	142.6992	147.4558	142.6992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.9171	285.8529	278.4548	262.7051	242.8240	224.1385	211.6554	208.7196	216.1177	231.8674	251.7486	270.4341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815 (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)	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517 (71)
Water heating gains (Table 5)	121.2573	118.5704	113.3947	102.0512	95.1030	87.8404	83.3798	87.0654	91.3864	99.4450	110.3191	119.8070 (72)
Total internal gains	615.7181	631.2561	603.3931	581.0566	549.4706	525.2791	503.5788	504.3286	520.8043	542.8560	578.3679	601.7847 (73)

6. Solar gains

Full SAP Calculation Printout



[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			
North	1.0000				10.6334	0.5500	0.7000	0.7700	2.8370 (74)			
South	7.1500				46.7521	0.5500	0.7000	0.7700	89.1868 (78)			
North	36.2400				26.0000	0.5500	0.7000	1.0000	326.4862 (82)			
South	0.8000				26.0000	0.5500	0.7000	1.0000	7.2072 (82)			
Solar gains	425.7172	844.5422	1427.3724	2150.2415	2703.2661	2799.0996	2651.6677	2230.9044	1681.3909	1011.0665	532.7506	348.9523 (83)
Total gains	1041.4353	1475.7984	2030.7655	2731.2981	3252.7367	3324.3787	3155.2465	2735.2330	1553.9226	1111.1185		950.7370 (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)												
tau	58.8690	59.0282	59.1882	60.0015	60.1669	61.0075	61.0075	Aug 61.1784	Sep 60.6684	Oct 60.1669	Nov 59.8371	Dec 59.5109
alpha	4.9246	4.9352	4.9459	5.0001	5.0111	5.0672	5.0672	5.0786	5.0446	5.0111	4.9891	4.9674
util living area	0.9852	0.9370	0.7919	0.5450	0.3583	0.2387	0.1730	0.2080	0.3888	0.7548	0.9602	0.9900 (86)
MIT	20.1145	20.4368	20.7565	20.9102	20.9349	20.9385	20.9388	20.9389	20.9352	20.8383	20.4288	20.0584 (87)
Th 2	20.0111	20.0135	20.0159	20.0280	20.0304	20.0425	20.0425	20.0449	20.0376	20.0304	20.0256	20.0207 (88)
util rest of house	0.9811	0.9225	0.7586	0.5049	0.3215	0.2031	0.1354	0.1649	0.3355	0.7053	0.9483	0.9871 (89)
MIT 2	18.9905	19.3898	19.7583	19.9249	19.9488	19.9638	19.9640	19.9666	19.9569	19.8655	19.3966	18.9275 (90)
Living area fraction	19.2639	19.6444	20.0011	20.1645	20.1886	20.2009	20.2011	20.2030	fLA = Living area / (4) =	20.1021	19.6476	0.2432 (91)
Temperature adjustment	19.1139	19.4944	19.8511	20.0145	20.0386	20.0509	20.0511	20.0530	20.0448	19.9521	19.4976	19.2026 (92)
adjusted MIT												-0.1500
												19.0526 (93)
8. Space heating requirement												
Utilisation	0.9762	0.9134	0.7526	0.5043	0.3218	0.2034	0.1357	0.1652	0.3359	0.7010	0.9402	0.9833 (94)
Useful gains	1016.6079	1347.9767	1528.2677	1377.4093	1046.6427	676.1710	428.1898	451.9568	739.7140	1089.3199	1044.6529	934.8849 (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	1904.8500	1871.5703	1707.4984	1402.1943	1049.0949	676.3397	428.2047	451.9971	741.7484	1176.6071	1568.3668	1889.2266 (97)
Space heating kWh	660.8521	351.8548	133.3477	17.8452	1.8244	0.0000	0.0000	0.0000	0.0000	64.9417	377.0740	710.0302 (98a)
Space heating requirement - total per year (kWh/year)												2317.7701
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	660.8521	351.8548	133.3477	17.8452	1.8244	0.0000	0.0000	0.0000	0.0000	64.9417	377.0740	710.0302 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2317.7701
Space heating per m2										(98c) / (4) =		19.6006 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	660.8521	351.8548	133.3477	17.8452	1.8244	0.0000	0.0000	0.0000	0.0000	64.9417	377.0740	710.0302 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	738.3823	393.1339	148.9918	19.9387	2.0385	0.0000	0.0000	0.0000	0.0000	72.5605	421.3117	793.3298 (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	283.9686	251.0574	266.3752	233.2192	225.4459	202.4468	199.2141	207.4608	210.1254	235.1615	251.1225	280.7234 (64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	260.3460	229.0838	240.6886	205.4794	194.9575	171.0969	165.6483	174.8625	179.6763	205.8130	225.4831	256.7201 (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	82.1215	74.1742	82.1215	79.4724	82.1215	79.4724	82.1215	82.1215	79.4724	82.1215	79.4724	82.1215 (231)
Lighting	101.7680	81.6420	73.5096	53.8563	41.6001	33.9877	37.9490	49.3276	64.0717	84.0655	94.9518	104.5964 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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)	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)	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)

Full SAP Calculation Printout



Annual totals kWh/year	
Space heating fuel - main system 1	2589.6873 (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	2509.8556 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)	
mechanical ventilation fans (SFP = 0.8820)	325.9141 (230a)
central heating pump	41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000 (230f)
Total electricity for the above, kWh/year	966.9141 (231)
Electricity for lighting (calculated in Appendix L)	821.3258 (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	6887.7827 (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	2589.6873	0.2100	543.8343 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2509.8556	0.2100	527.0697 (264)
Space and water heating			1070.9040 (265)
Pumps, fans and electric keep-hot	966.9141	0.1387	134.1229 (267)
Energy for lighting	821.3258	0.1443	118.5427 (268)
Total CO2, kg/year			1323.5696 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.1900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2589.6873	1.1300	2926.3466 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2509.8556	1.1300	2836.1368 (278)
Space and water heating			5762.4834 (279)
Pumps, fans and electric keep-hot	966.9141	1.5128	1462.7477 (281)
Energy for lighting	821.3258	1.5338	1259.7769 (282)
Total Primary energy kWh/year			8485.0079 (286)
Dwelling Primary energy Rate (DPER)			71.7500 (287)

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

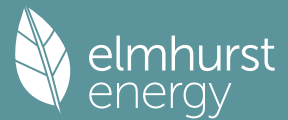
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	48.3600 (1b)	x 2.5000 (2b)	= 120.9000 (1b) - (3b)
First floor	48.3900 (1c)	x 2.6100 (2c)	= 126.2979 (1c) - (3c)
Second floor	21.5000 (1d)	x 2.5900 (2d)	= 55.6850 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	302.8829 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1321 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3821 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3534 (21)

Full SAP Calculation Printout



Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4506	0.4418	0.4329	0.3888	0.3799	0.3357	0.3357	0.3269	0.3534	0.3799	0.3976	0.4153 (22b)
Effective ac	0.6015	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5534	0.5624	0.5722	0.5790	0.5862 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			4.9900	1.1450	5.7137		(27)
TER Roof Light			22.6700	1.5918	45.8401		(27a)
Heatloss Floor 1			48.3600	0.1300	6.2868		(28a)
External Wall 1	112.7000	6.8800	105.8200	0.1800	19.0476		(29a)
pitched roof	45.3900	22.1900	23.2000	0.1100	2.5520		(30)
Roof 2	17.2000	0.4800	16.7200	0.1100	1.8392		(30)
Total net area of external elements Aum(A, m2)			223.6500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	83.1694	(33)
Main dwelling							
Party Wall 1			58.1000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4520 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	19.7000	0.1600	3.1520
E6 Intermediate floor within a dwelling	19.7000	0.0000	0.0000
R8 Roof to wall (rafter)	24.8300	0.0600	1.4898
R4 Ridge (vaulted ceiling)	10.3000	0.0800	0.8240
E24 Eaves (insulation at ceiling level - inverted)	10.6500	0.2400	2.5560
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0800	0.6960
P1 Party wall - Ground floor	18.6000	0.0800	1.4880
E18 Party wall between dwellings	11.3000	0.0600	0.6780
P4 Party wall - Roof (insulation at ceiling level)	3.3800	0.1200	0.4056
P2 Party wall - Intermediate floor within a dwelling	17.7300	0.0000	0.0000
E16 Corner (normal)	11.3000	0.0900	1.0170
E12 Gable (insulation at ceiling level)	3.1000	0.0600	0.1860
E13 Gable (insulation at rafter level)	2.7900	0.0800	0.2232
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	4.2000	0.0500	0.2100
E4 Jamb	15.9000	0.0500	0.7950

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9756 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 97.1450 (37)

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

(38)m	Jan 60.1226	Feb 59.7286	Mar 59.3424	Apr 57.5283	May 57.1889	Jun 55.6090	Jul 55.6090	Aug 55.3164	Sep 56.2176	Oct 57.1889	Nov 57.8755	Dec 58.5934 (38)
Heat transfer coeff	157.2676	156.8736	156.4874	154.6734	154.3340	152.7540	152.7540	152.4614	153.3626	154.3340	155.0206	155.7384 (39)
Average = Sum(39)m / 12 =												154.6717

HLP	Jan 1.3300	Feb 1.3266	Mar 1.3234	Apr 1.3080	May 1.3051	Jun 1.2918	Jul 1.2918	Aug 1.2893	Sep 1.2969	Oct 1.3051	Nov 1.3110	Dec 1.3170 (40)
HLP (average)												1.3080
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

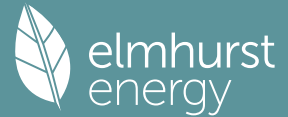
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8563 (42)
Hot water usage for mixer showers												
	72.1104	71.0268	69.4476	66.4262	64.1965	61.7100	60.2966	61.8638	63.5817	66.2515	69.3378	71.8342 (42a)
Hot water usage for baths												
	31.1331	30.6707	30.0196	28.8191	27.9201	26.9233	26.3849	27.0315	27.7354	28.8020	30.0273	31.0278 (42b)
Hot water usage for other uses												
	43.8813	42.2856	40.6899	39.0942	37.4986	35.9029	35.9029	37.4986	39.0942	40.6899	42.2856	43.8813 (42c)
Average daily hot water use (litres/day)												135.2407 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.1248	143.9831	140.1571	134.3395	129.6152	124.5362	122.5844	126.3938	130.4114	135.7435	141.6507	146.7433 (44)
Energy conte	233.0097	205.0300	215.4163	183.9041	174.4870	153.1317	148.2552	156.5019	160.8103	184.2026	201.8074	229.7645 (45)
Energy content (annual)										Total = Sum(45)m =		2246.3207
Distribution loss (46)m = 0.15 x (45)m	34.9515	30.7545	32.3124	27.5856	26.1730	22.9698	22.2383	23.4753	24.1215	27.6304	30.2711	34.4647 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	283.9686	251.0574	266.3752	233.2192	225.4459	202.4468	199.2141	207.4608	210.1254	235.1615	251.1225	280.7234 (62)
WWHRS	-32.9659	-29.1553	-30.5297	-25.2798	-23.5599	-20.1604	-18.8971	-20.0952	-20.8587	-24.5901	-27.8576	-32.3554 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	251.0027	221.9021	235.8454	207.9393	201.8860	182.2864	180.3170	187.3656	189.2667	210.5714	223.2649	248.3680 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2540.0155 (64)
Electric shower(s)												2540 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	90.2155	79.6793	84.3656	73.4769	70.7566	63.2451	62.0346	64.7766	65.7982	73.9871	79.4297	89.1364 (65)

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

Full SAP Calculation Printout



Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	142.6992	157.9884	142.6992	147.4558	142.6992	147.4558	142.6992	142.6992	147.4558	142.6992	147.4558	142.6992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	282.9171	285.8529	278.4548	262.7051	242.8240	224.1385	211.6554	208.7196	216.1177	231.8674	251.7486	270.4341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815 (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)												
	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517 (71)
Water heating gains (Table 5)												
	121.2573	118.5704	113.3947	102.0512	95.1030	87.8404	83.3798	87.0654	91.3864	99.4450	110.3191	119.8070 (72)
Total internal gains												
	615.7181	631.2561	603.3931	581.0566	549.4706	525.2791	503.5788	504.3286	520.8043	542.8560	578.3679	601.7847 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North		0.6100	10.6334	0.6300	0.7000	0.7700	1.9823 (74)
South		4.3800	46.7521	0.6300	0.7000	0.7700	62.5816 (78)
North		22.1900	26.0000	0.6300	0.7000	1.0000	228.9875 (82)
South		0.4800	26.0000	0.6300	0.7000	1.0000	4.9533 (82)
Solar gains							
	298.5047	592.1579	1000.7760	1507.5565	1895.2563	1962.4334	1859.0743
Total gains							
	914.2228	1223.4140	1604.1691	2088.6131	2444.7269	2487.7125	2362.6531
							1564.0977
							1178.8604
							708.9070
							373.5509
							244.6810 (83)
							846.4657 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.1327	48.2535	48.3726	48.9400	49.0476	49.5549	49.5549	49.6500	49.3583	49.0476	48.8303	48.6053
alpha	4.2088	4.2169	4.2248	4.2627	4.2698	4.3037	4.3037	4.3100	4.2906	4.2698	4.2554	4.2404
util living area												
	0.9923	0.9752	0.9191	0.7631	0.5606	0.3887	0.2836	0.3369	0.5891	0.8957	0.9825	0.9943 (86)
MIT												
	19.3949	19.7550	20.2571	20.7396	20.9391	20.9899	20.9980	20.9959	20.9465	20.5462	19.8573	19.3390 (87)
Th 2												
	19.8174	19.8200	19.8226	19.8346	19.8368	19.8473	19.8473	19.8492	19.8432	19.8368	19.8323	19.8275 (88)
util rest of house												
	0.9899	0.9680	0.8978	0.7163	0.4987	0.3205	0.2097	0.2537	0.5029	0.8589	0.9762	0.9926 (89)
MIT 2												
	17.9780	18.4338	19.0494	19.5998	19.7927	19.8422	19.8467	19.8479	19.8118	19.4150	18.5765	17.9137 (90)
Living area fraction												
									fLA = Living area / (4) =			0.2432 (91)
MIT												
	18.3226	18.7552	19.3432	19.8770	20.0715	20.1214	20.1267	20.1271	20.0878	19.6901	18.8880	18.2603 (92)
Temperature adjustment												
												0.0000
adjusted MIT												
	18.3226	18.7552	19.3432	19.8770	20.0715	20.1214	20.1267	20.1271	20.0878	19.6901	18.8880	18.2603 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9855	0.9592	0.8875	0.7182	0.5115	0.3369	0.2277	0.2740	0.5219	0.8534	0.9691	0.9890 (94)
Useful gains	900.9349	1173.5358	1423.6725	1499.9507	1250.5649	838.0918	538.0004	566.6667	887.0155	1068.2157	922.5353	837.1753 (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												
	2205.3008	2173.5105	2009.7920	1697.8497	1292.0136	843.4121	538.7183	568.2411	918.2994	1402.9181	1827.3826	2189.7318 (97)
Space heating kWh												
	970.4482	671.9830	436.0729	142.4873	30.8379	0.0000	0.0000	0.0000	0.0000	249.0185	651.4901	1006.3021 (98a)
Space heating requirement - total per year (kWh/year)												
												4158.6400
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												
	970.4482	671.9830	436.0729	142.4873	30.8379	0.0000	0.0000	0.0000	0.0000	249.0185	651.4901	1006.3021 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												4158.6400
Space heating per m ²												
										(98c) / (4) =		35.1682 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement												
	970.4482	671.9830	436.0729	142.4873	30.8379	0.0000	0.0000	0.0000	0.0000	249.0185	651.4901	1006.3021 (98)
Space heating efficiency (main heating system 1)												
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)												
	1050.2686	727.2543	471.9404	154.2070	33.3743	0.0000	0.0000	0.0000	0.0000	269.5006	705.0758	1089.0715 (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												
	251.0027	221.9021	235.8454	207.9393	201.8860	182.2864	180.3170	187.3656	189.2667	210.5714	223.2649	248.3680 (64)
Efficiency of water heater												
												80.3000 (216)

Full SAP Calculation Printout



(217)m	86.9856	86.5977	85.6792	83.5879	81.3427	80.3000	80.3000	80.3000	80.3000	84.7418	86.5346	87.0544	(217)
Fuel for water heating, kWh/month	288.5567	256.2449	275.2658	248.7672	248.1919	227.0068	224.5541	233.3321	235.6995	248.4860	258.0065	285.3021	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	29.6501	23.7864	21.4170	15.6910	12.1202	9.9023	11.0564	14.3716	18.6673	24.4925	27.6642	30.4741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.5358	-64.3516	-92.7060	-104.4453	-112.7506	-105.2179	-103.8413	-97.9223	-87.5711	-73.5946	-50.0857	-39.3439	(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	-25.2728	-53.2137	-105.8790	-159.2149	-210.7461	-211.8947	-209.4777	-177.3323	-129.8837	-76.2574	-33.7878	-19.9880	(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												4500.6926	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3029.4135	(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)												239.2931	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2390.3142	(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												5465.0850	(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	4500.6926	0.2100	945.1454 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3029.4135	0.2100	636.1768 (264)
Space and water heating			1581.3223 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	239.2931	0.1443	34.5374 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.3661	0.1346	-131.5097
PV Unit electricity exported	-1412.9481	0.1259	-177.8222
Total			-309.3319 (269)
Total CO2, kg/year			1318.4570 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4500.6926	1.1300	5085.7827 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3029.4135	1.1300	3423.2372 (278)
Space and water heating			8509.0199 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	239.2931	1.5338	367.0357 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.3661	1.4973	-1463.4023
PV Unit electricity exported	-1412.9481	0.4620	-652.7259
Total			-2116.1282 (283)
Total Primary energy kWh/year			6890.0283 (286)
Target Primary Energy Rate (TPER)			58.2700 (287)

Energy Assessment

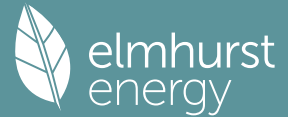
The Dower House, 393 High Street

eight
versa

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

Baseline New build - TER from the Be Green scenario TER SAP worksheet
Be Green New build - DER from the Be Green scenario DER SAP worksheet

Full SAP Calculation Printout



Property Reference	Plot 1	Issued on Date	07/11/2025
Assessment Reference	00001	Prop Type Ref	
Property			
SAP Rating	81 B	DER	4.20
Environmental	96 A	% DER < TER	58.04
CO ₂ Emissions (t/year)	0.44	DFEE	31.68
Compliance Check	See BREL	% DFEE < TFEE	12.49
% DPER < TPER	14.62	DPER	44.72
		TPER	52.37
Assessor Details	Ms. Vanessa Vienna	Assessor ID	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	56.2000 (1b)	x 2.5000 (2b)	= 140.5000 (1b) - (3b)
First floor	56.2000 (1c)	x 2.3300 (2c)	= 130.9460 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 271.4460 (5)

2. Ventilation rate

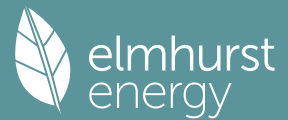
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												84.6000 (23c)
Effective ac	0.2682	0.2645	0.2607	0.2420	0.2382	0.2195	0.2195	0.2157	0.2270	0.2382	0.2457	0.2532 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			8.1500	1.1450	9.3321		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			2.0000	1.1450	2.2901		(27a)
Heatloss Floor 1			56.2000	0.1000	5.6200	110.0000	6182.0000 (28a)
External Wall 1	111.4000	10.0400	101.3600	0.1300	13.1768	190.0000	19258.4003 (29a)
pitched roof	75.0000	2.0000	73.0000	0.1000	7.3000	9.0000	657.0000 (30)
Total net area of external elements A _{um} (A, m ²)			242.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9869		(33)
Main dwelling							
Internal Wall 1			40.0800			9.0000	360.7200 (32c)
Internal Floor 1			56.2000			18.0000	1011.6000 (32d)
Internal Ceiling 1			56.2000			0.0000	0.0000 (32e)
Heat capacity C _m = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	27469.7203 (34)

Full SAP Calculation Printout



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

244.3925 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	17.8100	0.0900	1.6029
E17 Corner (inverted - internal area greater than external area)	4.2700	-0.0900	-0.3843
E5 Ground floor (normal)	30.6800	0.1600	4.9088
E6 Intermediate floor within a dwelling	21.8000	0.0700	1.5260
E13 Gable (insulation at rafter level)	16.6800	0.0400	0.6672
E11 Eaves (insulation at rafter level)	9.0700	0.0400	0.3628
R4 Ridge (vaulted ceiling)	9.0000	0.1200	1.0800
E2 Other lintels (including other steel lintels)	7.3200	0.2000	1.4640
E3 Sill	6.4300	0.0400	0.2572
E4 Jamb	22.6000	0.0500	1.1300
R8 Roof to wall (rafter)	9.0700	0.1200	1.0884

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

13.7030 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 53.6899 (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	24.0291	23.6932	23.3572	21.6777	21.3418	19.6622	19.6622	19.3263	20.3340	21.3418	22.0136	22.6854 (38)
Heat transfer coeff	77.7190	77.3831	77.0472	75.3676	75.0317	73.3521	73.3521	73.0162	74.0240	75.0317	75.7035	76.3754 (39)
Average = Sum(39)m / 12 =												75.2836

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6915	0.6885	0.6855	0.6705	0.6675	0.6526	0.6526	0.6496	0.6586	0.6675	0.6735	0.6795 (40)
HLP (average)												0.6698
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8285 (42)
Hot water usage for mixer showers	71.6443	70.5676	68.9987	65.9968	63.7815	61.3111	59.9068	61.4639	63.1707	65.8233	68.8896	71.3698	(42a)
Hot water usage for baths	30.9326	30.4732	29.8263	28.6335	27.7403	26.7500	26.2150	26.8574	27.5569	28.6166	29.8340	30.8280	(42b)
Hot water usage for other uses	43.5966	42.0112	40.4259	38.8406	37.2552	35.6699	35.6699	37.2552	38.8406	40.4259	42.0112	43.5966	(42c)
Average daily hot water use (litres/day)													134.3663 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.1735	143.0521	139.2509	133.4709	128.7771	123.7309	121.7918	125.5766	129.5682	134.8658	140.7348	145.7944	(44)
Energy content (annual)	231.5030	203.7042	214.0234	182.7150	173.3588	152.1416	147.2966	155.4900	159.7705	183.0116	200.5025	228.2788	(45)
Distribution loss (46)m = 0.15 x (45)m	34.7255	30.5556	32.1035	27.4072	26.0038	22.8212	22.0945	23.3235	23.9656	27.4517	30.0754	34.2418	(46)
Water storage loss:													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0800 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													1.2480 (55)
Total storage loss	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(56)
If cylinder contains dedicated solar storage	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(57)
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	301.3522	266.7938	283.8726	250.3110	243.2080	212.0936	209.2470	217.4404	219.7225	252.8608	268.0985	298.1280	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	301.3522	266.7938	283.8726	250.3110	243.2080	212.0936	209.2470	217.4404	219.7225	252.8608	268.0985	298.1280	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3023.1285	(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	132.8541	118.2033	127.0422	114.8295	113.5211	98.5487	98.5364	101.2607	101.0853	116.7307	120.7439	131.7821	(65)

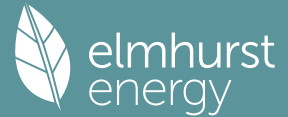
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.2307	179.6126	162.2307	167.6384	162.2307	167.6384	162.2307	167.6384	162.2307	167.6384	162.2307	162.2307 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	274.9600	277.8133	270.6232	255.3165	235.9945	217.8345	205.7026	202.8493	210.0394	225.3461	244.6681	262.8281 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425	37.1425 (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)	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396 (71)
Water heating gains (Table 5)	178.5674	175.8978	170.7556	159.4855	152.5822	136.8732	132.4414	136.1032	140.3962	156.8961	167.6998	177.1264 (72)
Total internal gains	681.1855	698.7510	669.0369	647.8677	616.2347	587.7735	565.8021	566.6106	583.5014	609.9003	645.4337	667.6125 (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
East	7.4300	19.6403	0.5500	0.7000	0.7700	38.9341 (76)

Full SAP Calculation Printout



South	0.7200	46.7521	0.5500	0.7000	0.7700	8.9811 (78)
West	2.0000	26.0000	0.5500	0.7000	1.0000	18.0180 (82)

Solar gains	65.9331	128.2940	210.6944	308.0584	379.3133	389.3351	370.2184	316.6329	245.1477	151.9769	82.0609	54.3310 (83)
Total gains	747.1186	827.0450	879.7313	955.9261	995.5480	977.1086	936.0205	883.2435	828.6490	761.8772	727.4946	721.9435 (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	98.1803	98.6065	99.0364	101.2435	101.6967	104.0253	104.0253	104.5039	103.0812	101.6967	100.7942	99.9076
alpha	7.5454	7.5738	7.6024	7.7496	7.7798	7.9350	7.9350	7.9669	7.8721	7.7798	7.7196	7.6605
util living area	0.9934	0.9844	0.9604	0.8638	0.6871	0.4797	0.3448	0.3802	0.6111	0.8964	0.9814	0.9946 (86)
Living	20.5165	20.6151	20.7421	20.8909	20.9490	20.9602	20.9607	20.9609	20.9569	20.8821	20.6894	20.5086
Non living	19.7782	19.9050	20.0644	20.2490	20.3096	20.3322	20.3325	20.3354	20.3246	20.2449	20.0108	19.7774
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	20.7526	20.6151	20.7421	20.8909	20.9490	20.9602	20.9607	20.9609	20.9569	20.8821	20.6894	20.5773 (87)
Th 2	20.3484	20.3510	20.3537	20.3669	20.3696	20.3829	20.3829	20.3856	20.3776	20.3696	20.3643	20.3590 (88)
util rest of house	0.9915	0.9803	0.9501	0.8364	0.6449	0.4338	0.2964	0.3294	0.5582	0.8683	0.9756	0.9931 (89)
MIT 2	20.1211	19.9050	20.0644	20.2490	20.3096	20.3322	20.3325	20.3354	20.3246	20.2449	20.0108	19.8822 (90)
Living area fraction									FLA = Living area / (4) =			0.1193 (91)
MIT	20.1964	19.9897	20.1453	20.3256	20.3859	20.4071	20.4075	20.4100	20.4000	20.3209	20.0918	19.9651 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1964	19.9897	20.1453	20.3256	20.3859	20.4071	20.4075	20.4100	20.4000	20.3209	20.0918	19.9651 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9910	0.9774	0.9463	0.8344	0.6461	0.4356	0.2984	0.3315	0.5601	0.8659	0.9726	0.9919 (94)
Useful gains	740.3882	808.3751	832.4800	797.6595	643.1767	425.6355	279.2741	292.7662	464.1325	659.6803	707.5913	716.1298 (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	1235.4552	1167.6877	1051.3298	861.1199	651.7174	425.9665	279.2874	292.7959	466.3546	729.3757	983.5244	1204.0680 (97)
Space heating kWh	368.3298	241.4581	162.8242	45.6915	6.3543	0.0000	0.0000	0.0000	0.0000	51.8534	198.6718	363.0260 (98a)
Space heating requirement - total per year (kWh/year)												1438.2092
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	368.3298	241.4581	162.8242	45.6915	6.3543	0.0000	0.0000	0.0000	0.0000	51.8534	198.6718	363.0260 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1438.2092
Space heating per m2										(98c) / (4) =		12.7955 (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 %)												332.2550 (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	368.3298	241.4581	162.8242	45.6915	6.3543	0.0000	0.0000	0.0000	0.0000	51.8534	198.6718	363.0260 (98)
Space heating efficiency (main heating system 1)	332.2550	332.2550	332.2550	332.2550	332.2550	0.0000	0.0000	0.0000	0.0000	332.2550	332.2550	332.2550 (210)
Space heating fuel (main heating system)	110.8576	72.6725	49.0058	13.7519	1.9125	0.0000	0.0000	0.0000	0.0000	15.6065	59.7950	109.2613 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	301.3522	266.7938	283.8726	250.3110	243.2080	212.0936	209.2470	217.4404	219.7225	252.8608	268.0985	298.1280 (64)
Efficiency of water heater (217)m	181.3795	181.3795	181.3795	181.3795	181.3795	181.3795	181.3795	181.3795	181.3795	181.3795	181.3795	181.3795 (216)
Fuel for water heating, kWh/month	166.1446	147.0915	156.5076	138.0040	134.0879	116.9336	115.3642	119.8815	121.1396	139.4098	147.8108	164.3670 (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	20.8697	18.8500	20.8697	20.1965	20.8697	20.1965	20.8697	20.8697	20.1965	20.8697	20.1965	20.8697 (231)
Lighting	115.6971	92.8165	83.5710	61.2277	47.2940	38.6396	43.1432	56.0792	72.8413	95.5717	107.9480	118.9127 (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												432.8631 (211)

Full SAP Calculation Printout



Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	181.3795	
Water heating fuel used	1666.7420	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)		
mechanical ventilation fans (SFP = 0.7420)	245.7238	(230a)
Total electricity for the above, kWh/year	245.7238	(231)
Electricity for lighting (calculated in Appendix L)	933.7421	(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	3279.0709	(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	432.8631	0.1580	68.3754	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1666.7420	0.1411	235.1102	(264)
Space and water heating			303.4856	(265)
Pumps, fans and electric keep-hot	245.7238	0.1387	34.0849	(267)
Energy for lighting	933.7421	0.1443	134.7678	(268)
Total CO2, kg/year			472.3384	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2000	(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	432.8631	1.5847	685.9744	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1666.7420	1.5216	2536.1139	(278)
Space and water heating			3222.0883	(279)
Pumps, fans and electric keep-hot	245.7238	1.5128	371.7309	(281)
Energy for lighting	933.7421	1.5338	1432.2048	(282)
Total Primary energy kWh/year			5026.0240	(286)
Dwelling Primary energy Rate (DPER)			44.7200	(287)

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

1. Overall dwelling characteristics

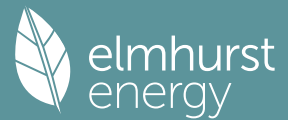
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	56.2000 (1b)	x 2.5000 (2b)	= 140.5000 (1b) - (3b)	
First floor	56.2000 (1c)	x 2.3300 (2c)	= 130.9460 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.4000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 271.4460	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1474 (8)
Pressure Test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3974 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3974 (21)

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

Full SAP Calculation Printout



Effective ac	0.5066	0.4967	0.4868	0.4371	0.4272	0.3775	0.3775	0.3676	0.3974	0.4272	0.4470	0.4669 (22b)
	0.6283	0.6234	0.6185	0.5955	0.5912	0.5712	0.5712	0.5675	0.5789	0.5912	0.5999	0.6090 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.1500	1.1450	9.3321		(27)
TER Roof Light			2.0000	1.5918	4.0441		(27a)
Heatloss Floor 1			56.2000	0.1300	7.3060		(28a)
External Wall 1	111.4000	10.0400	101.3600	0.1800	18.2448		(29a)
pitched roof	75.0000	2.0000	73.0000	0.1100	8.0300		(30)
Total net area of external elements Aum(A, m2)			242.6000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	48.8470	(33)

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

244.3925 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	17.8100	0.0900	1.6029
E17 Corner (inverted - internal area greater than external area)	4.2700	-0.0900	-0.3843
E5 Ground floor (normal)	30.6800	0.1600	4.9088
E6 Intermediate floor within a dwelling	21.8000	0.0000	0.0000
E13 Gable (insulation at rafter level)	16.6800	0.0800	1.3344
E11 Eaves (insulation at rafter level)	9.0700	0.0400	0.3628
R4 Ridge (vaulted ceiling)	9.0000	0.0800	0.7200
E2 Other lintels (including other steel lintels)	7.3200	0.0500	0.3660
E3 Sill	6.4300	0.0500	0.3215
E4 Jamb	22.6000	0.0500	1.1300
R8 Roof to wall (rafter)	9.0700	0.0600	0.5442

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

10.9063 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 59.7533 (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	56.2848	55.8384	55.4008	53.3455	52.9610	51.1709	51.1709	50.8394	51.8604	52.9610	53.7389	54.5522 (38)
Heat transfer coeff	116.0381	115.5916	115.1541	113.0988	112.7143	110.9242	110.9242	110.5927	111.6137	112.7143	113.4922	114.3055 (39)
Average = Sum(39)m / 12 =												113.0970

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0324	1.0284	1.0245	1.0062	1.0028	0.9869	0.9869	0.9839	0.9930	1.0028	1.0097	1.0170 (40)
HLP (average)												1.0062
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

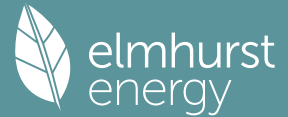
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8285 (42)
Hot water usage for mixer showers												
71.6443	70.5676	68.9987	65.9968	63.7815	61.3111	59.9068	61.4639	63.1707	65.8233	68.8896	71.3698	(42a)
Hot water usage for baths												
30.9326	30.4732	29.8263	28.6335	27.7403	26.7500	26.2150	26.8574	27.5569	28.6166	29.8340	30.8280	(42b)
Hot water usage for other uses												
43.5966	42.0112	40.4259	38.8406	37.2552	35.6699	35.6699	37.2552	38.8406	40.4259	42.0112	43.5966	(42c)
Average daily hot water use (litres/day)												134.3663 (43)
Daily hot water use												
146.1735	143.0521	139.2509	133.4709	128.7771	123.7309	121.7918	125.5766	129.5682	134.8658	140.7348	145.7944	(44)
Energy conte	231.5030	203.7042	214.0234	182.7150	173.3588	152.1416	147.2966	155.4900	159.7705	183.0116	200.5025	228.2788 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
34.7255	30.5556	32.1035	27.4072	26.0038	22.8212	22.0945	23.3235	23.9656	27.4517	30.0754	34.2418	(46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1127 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1409 (55)
Total storage loss												
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage												
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	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	(61)
Total heat required for water heating calculated for each month												
290.1319	256.6593	272.6523	239.4526	231.9876	208.8792	205.9254	214.1188	216.5080	241.6404	257.2401	286.9076	(62)
WWHRS	-32.7528	-28.9668	-30.3324	-25.1164	-23.4076	-20.0300	-18.7750	-19.9653	-20.7239	-24.4311	-27.6775	-32.1462 (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	(63c)
FGHRS	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												
257.3791	227.6925	242.3199	214.3361	208.5800	188.8491	187.1504	194.1535	195.7842	217.2092	229.5625	254.7614	(64)
Total per year (kWh/year)												
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
123.8778	110.0957	118.0658	106.1428	104.5448	95.9771	95.8792	98.6035	98.5137	107.7544	112.0571	122.8057	(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	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245	141.4245 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
162.2307	179.6126	162.2307	167.6384	162.2307	167.6384	162.2307	162.2307	167.6384	162.2307	167.6384	162.2307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
274.9600	277.8133	270.6232	255.3165	235.9945	217.8345	205.7026	202.8493	210.0394	225.3461	244.6681	262.8281	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

Full SAP Calculation Printout



Pumps, fans	37.1425 3.0000	37.1425 3.0000	37.1425 3.0000	37.1425 3.0000	37.1425 3.0000	37.1425 0.0000	37.1425 0.0000	37.1425 0.0000	37.1425 0.0000	37.1425 3.0000	37.1425 3.0000	37.1425 (69) 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396	-113.1396 (71)
Water heating gains (Table 5)	166.5024	163.8329	158.6907	147.4205	140.5173	133.3016	128.8699	132.5316	136.8246	144.8312	155.6349	165.0615 (72)
Total internal gains	672.1205	689.6861	659.9719	638.8028	607.1698	584.2019	562.2305	563.0390	579.9298	600.8353	636.3688	658.5476 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East				7.4300	19.6403		0.6300	0.7000		0.7700		44.5972 (76)	
South				0.7200	46.7521		0.6300	0.7000		0.7700		10.2874 (78)	
West				2.0000	26.0000		0.6300	0.7000		1.0000		20.6388 (82)	
Solar gains	75.5234	146.9549	241.3409	352.8669	434.4861	445.9657	424.0684	362.6886	280.8055	174.0826	93.9970	62.2336 (83)	
Total gains	747.6440	836.6410	901.3128	991.6697	1041.6559	1030.1676	986.2988	925.7276	860.7353	774.9180	730.3657	720.7813 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	65.7584	66.0124	66.2632	67.4674	67.6975	68.7900	68.7900	68.9962	68.3650	67.6975	67.2335	66.7552
util living area	5.3839	5.4008	5.4175	5.4978	5.5132	5.5860	5.5860	5.5997	5.5577	5.5132	5.4822	5.4503
	0.9963	0.9926	0.9834	0.9465	0.8491	0.6598	0.4899	0.5407	0.7967	0.9629	0.9921	0.9970 (86)
MIT	19.8159	19.9763	20.2213	20.5712	20.8365	20.9698	20.9951	20.9918	20.9156	20.5747	20.1497	19.8037 (87)
Th 2	20.0564	20.0597	20.0630	20.0782	20.0810	20.0943	20.0943	20.0968	20.0892	20.0810	20.0752	20.0692 (88)
util rest of house	0.9952	0.9903	0.9778	0.9285	0.8023	0.5783	0.3917	0.4391	0.7240	0.9467	0.9891	0.9961 (89)
MIT 2	18.6754	18.8822	19.1949	19.6385	19.9414	20.0767	20.0926	20.0937	20.0311	19.6519	19.1156	18.6692 (90)
Living area fraction	18.8115	19.0127	19.3174	19.7498	20.0482	20.1832	20.2003	20.2009	20.1366	19.7620	19.2390	18.8046 (92)
MIT	18.8115	19.0127	19.3174	19.7498	20.0482	20.1832	20.2003	20.2009	20.1366	19.7620	19.2390	18.8046 (93)
Temperature adjustment	18.8115	19.0127	19.3174	19.7498	20.0482	20.1832	20.2003	20.2009	20.1366	19.7620	19.2390	18.8046 (93)
adjusted MIT	18.8115	19.0127	19.3174	19.7498	20.0482	20.1832	20.2003	20.2009	20.1366	19.7620	19.2390	18.8046 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9929	0.9866	0.9719	0.9206	0.8004	0.5867	0.4034	0.4511	0.7282	0.9394	0.9853	0.9941 (94)
Ext temp.	742.3625	825.4196	875.9919	912.9690	833.7238	604.3998	397.8353	417.5743	626.8240	727.9695	719.6082	716.5522 (95)
Heat loss rate W	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)
Space heating kWh	1683.8848	1631.3142	1475.9749	1227.0996	940.9632	619.3175	399.3621	420.3483	673.7685	1032.6863	1377.6830	1669.3802 (97)
Space heating requirement - total per year (kWh/year)	700.4926	541.5612	446.3873	226.1740	79.7862	0.0000	0.0000	0.0000	0.0000	226.7093	473.8139	708.9040 (98a)
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)	700.4926	541.5612	446.3873	226.1740	79.7862	0.0000	0.0000	0.0000	0.0000	226.7093	473.8139	708.9040 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	700.4926	541.5612	446.3873	226.1740	79.7862	0.0000	0.0000	0.0000	0.0000	226.7093	473.8139	708.9040 (98c)
Space heating per m ²												3403.8285 (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	700.4926	541.5612	446.3873	226.1740	79.7862	0.0000	0.0000	0.0000	0.0000	226.7093	473.8139	708.9040 (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)	758.9303	586.7402	483.6266	245.0423	86.4422	0.0000	0.0000	0.0000	0.0000	245.6222	513.3411	768.0433 (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	257.3791	227.6925	242.3199	214.3361	208.5800	188.8491	187.1504	194.1535	195.7842	217.2092	229.5625	254.7614 (64)
Efficiency of water heater (217)m	86.1881	85.9314	85.4107	84.1805	82.1023	79.8000	79.8000	79.8000	79.8000	84.1559	85.6474	79.8000 (216)
Fuel for water heating, kWh/month	298.6248	264.9701	283.7113	254.6148	254.0488	236.6531	234.5244	243.3001	245.3436	258.1033	268.0321	295.4474 (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	33.7083	27.0421	24.3484	17.8387	13.7791	11.2576	12.5698	16.3387	21.2223	27.8448	31.4506	34.6452 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-50.9217	-70.9244	-100.6778	-111.6781	-119.0825	-110.6036	-109.2067	-103.7657	-93.9424	-80.3973	-55.6668	-44.1246 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(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	-31.3662	-65.7004	-130.1014	-194.7260	-256.8587	-257.9185	-254.9068	-216.1124	-158.7657	-93.7483	-41.8040	-24.8261	(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												3687.7882	(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												3137.3736	(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)												272.0456	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2777.8258	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4405.3815	(238)

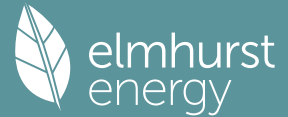
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3687.7882	0.2100	774.4355	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3137.3736	0.2100	658.8485	(264)
Space and water heating			1433.2840	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	272.0456	0.1443	39.2646	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1050.9914	0.1349	-141.7498	
PV Unit electricity exported	-1726.8344	0.1260	-217.5728	
Total			-359.3226	(269)
Total CO2, kg/year			1125.1552	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3687.7882	1.1300	4167.2006	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3137.3736	1.1300	3545.2322	(278)
Space and water heating			7712.4328	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	272.0456	1.5338	417.2726	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1050.9914	1.4985	-1574.8918	
PV Unit electricity exported	-1726.8344	0.4625	-798.6488	
Total			-2373.5406	(283)
Total Primary energy kWh/year			5886.2656	(286)
Target Primary Energy Rate (TPER)			52.3700	(287)

Full SAP Calculation Printout



Property Reference	Plot 2	Issued on Date	07/11/2025
Assessment Reference	00001	Prop Type Ref	
Property			
SAP Rating	80 C	DER	4.63
Environmental	96 A	% DER < TER	60.26
CO ₂ Emissions (t/year)	0.4	DFEE	34.67
Compliance Check	See BREL	% DFEE < TFEE	12.60
% DPER < TPER	19.34	DPER	49.22
		TPER	61.02
Assessor Details	Ms. Vanessa Vienna	Assessor ID	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	46.6500 (1b)	x 2.5000 (2b)	= 116.6250 (1b) - (3b)
First floor	46.6500 (1c)	x 2.2200 (2c)	= 103.5630 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 220.1880 (5)

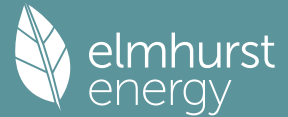
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.1912 0.1875 0.1837 0.1650 0.1612 0.1425 0.1425 0.1388 0.1500 0.1612 0.1687 0.1762 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	84.6000 (23c)
Effective ac	0.2682 0.2645 0.2607 0.2420 0.2382 0.2195 0.2195 0.2157 0.2270 0.2382 0.2457 0.2532 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			8.8500	1.1450	10.1336		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			1.3000	1.1450	1.4885		(27a)
Heatloss Floor 1			43.6500	0.1000	4.3650	110.0000	4801.5000 (28a)
External Wall 1	129.8700	10.7400	119.1300	0.1300	15.4869	190.0000	22634.6991 (29a)
pitched roof	67.9600	1.3000	66.6600	0.1000	6.6660	9.0000	599.9400 (30)
Total net area of external elements Aum(A, m ²)			241.4800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4080		(33)
Main dwelling							
Party Floor 1			130.7600			80.0000	10460.8000 (32d)
Internal Wall 1			28.1900			9.0000	253.7100 (32c)
Internal Floor 1			43.6500			18.0000	785.7000 (32d)
Internal Ceiling 1			43.6500			9.0000	392.8500 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	16.6800	0.0900	1.5012
E5 Ground floor (normal)	28.0000	0.1600	4.4800
E6 Intermediate floor within a dwelling	28.0000	0.0700	1.9600
E13 Gable (insulation at rafter level)	14.6100	0.0400	0.5844
E11 Eaves (insulation at rafter level)	18.6200	0.0400	0.7448
R4 Ridge (vaulted ceiling)	9.3100	0.1200	1.1172
E2 Other lintels (including other steel lintels)	7.1300	0.2000	1.4260
E3 Sill	6.2300	0.0400	0.2492
E4 Jamb	27.9000	0.0500	1.3950
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.4578 (36)
Point Thermal Bridges			0.0000 (36a)
Total fabric heat loss			53.8658 (37)

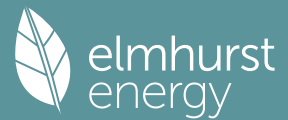
Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4916	19.2191	18.9466	17.5842	17.3117	15.9493	15.9493	15.6768	16.4943	17.3117	17.8567	18.4017	(38)
Heat transfer coeff	73.3574	73.0849	72.8125	71.4501	71.1776	69.8152	69.8152	69.5427	70.3601	71.1776	71.7225	72.2675	(39)
Average = $\text{Sum}(39)\text{m} / 12 =$												71.3819	
HLP	0.7863	0.7833	0.7804	0.7658	0.7629	0.7483	0.7483	0.7454	0.7541	0.7629	0.7687	0.7746	(40)
HLP (average)												0.7651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.6682 (42)
Hot water usage for mixer showers	68.9575	67.9212	66.4112	63.5219	61.3897	59.0118	57.6603	59.1589	60.8017	63.3548	66.3061	68.6933	(42a)
Hot water usage for baths	29.7772	29.3350	28.7122	27.5640	26.7042	25.7508	25.2358	25.8542	26.5276	27.5477	28.7196	29.6766	(42b)
Hot water usage for other uses	41.9555	40.4299	38.9042	37.3786	35.8529	34.3273	34.3273	35.8529	37.3786	38.9042	40.4299	41.9555	(42c)
Average daily hot water use (litres/day)												129.3261	(43)
Daily hot water use	140.6903	137.6861	134.0276	128.4644	123.9468	119.0899	117.2234	120.8661	124.7079	129.8067	135.4556	140.3254	(44)
Energy conte	222.8191	196.0632	205.9955	175.8614	166.8562	146.4349	141.7715	149.6575	153.7773	176.1465	192.9814	219.7157	(45)
Energy content (annual)										Total =	Sum(45)m =	2148.0800	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	33.4229	29.4095	30.8993	26.3792	25.0284	21.9652	21.2657	22.4486	23.0666	26.4220	28.9472	32.9574	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.2480	(55)
Total storage loss	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(56)
If cylinder contains dedicated solar storage													
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(57)
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	292.6683	259.1528	275.8447	243.4574	236.7054	206.3869	203.7219	211.6079	213.7293	245.9957	260.5774	289.5649	(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	292.6683	259.1528	275.8447	243.4574	236.7054	206.3869	203.7219	211.6079	213.7293	245.9957	260.5774	289.5649	(64)
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	2939.4124	(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	129.9667	115.6627	124.3728	112.5507	111.3590	96.6512	96.6993	99.3214	99.0925	114.4481	118.2431	128.9348	(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	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.3712	154.3038	139.3712	144.0169	139.3712	144.0169	139.3712	139.3712	144.0169	139.3712	144.0169	139.3712	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.0196	247.5621	241.1550	227.5151	210.2970	194.1145	183.3036	180.7611	187.1682	200.8082	218.0262	234.2087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	(71)
Water heating gains (Table 5)	174.6864	172.1171	167.1678	156.3204	149.6761	134.2378	129.9722	133.4965	137.6285	153.8281	164.2265	173.2995	(72)
Total internal gains	622.1009	637.0068	610.7178	590.8761	562.3681	535.3929	515.6707	516.6525	531.8373	557.0311	589.2933	609.9031	(73)

6. Solar gains													
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	0.3400	10.6334	0.5500	0.7000	0.7700	0.9646	(74)						
East	2.8100	19.6403	0.5500	0.7000	0.7700	14.7247	(76)						

Full SAP Calculation Printout



South			1.9500		46.7521		0.5500		0.7000		0.7700		24.3237 (78)
West			3.7500		19.6403		0.5500		0.7000		0.7700		19.6505 (80)
North			1.3000		26.0000		0.5500		0.7000		1.0000		11.7117 (82)

Solar gains	71.3752	133.2488	207.8627	291.4629	350.9676	357.4867	341.0130	296.3741	237.3748	154.6829	87.7485	59.5500 (83)
Total gains	693.4761	770.2556	818.5804	882.3390	913.3356	892.8796	856.6838	813.0266	769.2121	711.7140	677.0418	669.4531 (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	151.1973	151.7610	152.3289	155.2335	155.8278	158.8687	158.8687	159.4912	157.6382	155.8278	154.6438	153.4776
alpha	11.0798	11.1174	11.1553	11.3489	11.3885	11.5912	11.5912	11.6327	11.5092	11.3885	11.3096	11.2318
util living area												
	0.9992	0.9969	0.9862	0.9093	0.7196	0.5003	0.3586	0.3935	0.6300	0.9361	0.9959	0.9994 (86)
Living	20.6654	20.7364	20.8289	20.9366	20.9699	20.9730	20.9731	20.9732	20.9724	20.9299	20.7862	20.6579
Non living	19.8755	19.9682	20.0857	20.2183	20.2489	20.2638	20.2638	20.2665	20.2583	20.2163	20.0431	19.8751
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	20.8288	20.7364	20.8289	20.9366	20.9699	20.9730	20.9731	20.9732	20.9724	20.9299	20.7862	20.7058 (87)
Th 2	20.2653	20.2678	20.2703	20.2831	20.2856	20.2984	20.2984	20.3009	20.2933	20.2856	20.2805	20.2754 (88)
util rest of house												
	0.9988	0.9952	0.9791	0.8767	0.6668	0.4455	0.3014	0.3337	0.5661	0.9038	0.9934	0.9991 (89)
MIT 2	20.1099	19.9682	20.0857	20.2183	20.2489	20.2638	20.2638	20.2665	20.2583	20.2163	20.0431	19.9472 (90)
Living area fraction												
										fLA = Living area / (4) =		0.1823 (91)
MIT	20.2410	20.1083	20.2212	20.3493	20.3803	20.3931	20.3931	20.3953	20.3885	20.3464	20.1786	20.0855 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2410	20.1083	20.2212	20.3493	20.3803	20.3931	20.3931	20.3953	20.3885	20.3464	20.1786	20.0855 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9988	0.9947	0.9785	0.8800	0.6739	0.4529	0.3091	0.3417	0.5748	0.9070	0.9929	0.9990 (94)
Useful gains	692.6110	766.1984	801.0033	776.4457	615.4956	404.4242	264.8178	277.8459	442.1329	645.5236	672.2391	668.7992 (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												
	1169.3885	1111.4960	999.0739	818.0499	617.8454	404.4471	264.8181	277.8466	442.4567	693.7232	938.0307	1148.0075 (97)
Space heating kWh												
	354.7225	232.0399	147.3646	29.9550	1.7482	0.0000	0.0000	0.0000	0.0000	35.8605	191.3699	356.5310 (98a)
Space heating requirement - total per year (kWh/year)												1349.5916
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												
	354.7225	232.0399	147.3646	29.9550	1.7482	0.0000	0.0000	0.0000	0.0000	35.8605	191.3699	356.5310 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1349.5916
Space heating per m2										(98c) / (4) =		14.4651 (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 %)												326.8742 (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												
	354.7225	232.0399	147.3646	29.9550	1.7482	0.0000	0.0000	0.0000	0.0000	35.8605	191.3699	356.5310 (98)
Space heating efficiency (main heating system 1)												
	326.8742	326.8742	326.8742	326.8742	326.8742	0.0000	0.0000	0.0000	0.0000	326.8742	326.8742	326.8742 (210)
Space heating fuel (main heating system)												
	108.5196	70.9875	45.0830	9.1641	0.5348	0.0000	0.0000	0.0000	0.0000	10.9707	58.5454	109.0729 (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												
	292.6683	259.1528	275.8447	243.4574	236.7054	206.3869	203.7219	211.6079	213.7293	245.9957	260.5774	289.5649 (64)
Efficiency of water heater (217)m												
	181.6804	181.6804	181.6804	181.6804	181.6804	181.6804	181.6804	181.6804	181.6804	181.6804	181.6804	181.6804 (216)
Fuel for water heating, kWh/month												
	161.0896	142.6421	151.8296	134.0031	130.2867	113.5989	112.1320	116.4726	117.6403	135.4003	143.4263	159.3815 (219)
Space cooling fuel requirement (221)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa												
	13.7347	12.4055	13.7347	13.2916	13.7347	13.2916	13.7347	13.7347	13.2916	13.7347	13.2916	13.7347 (231)
Lighting												
	99.3945	79.7380	71.7952	52.6002	40.6299	33.1950	37.0640	48.1772	62.5774	82.1049	92.7373	102.1570 (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												

Full SAP Calculation Printout



Space heating fuel - main system 1	412.8780 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	181.6804
Water heating fuel used	1617.9030 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6020)	
mechanical ventilation fans (SFP = 0.6020)	161.7149 (230a)
Total electricity for the above, kWh/year	161.7149 (231)
Electricity for lighting (calculated in Appendix L)	802.1707 (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	2994.6666 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	412.8780	0.1585	65.4367 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1617.9030	0.1410	228.1971 (264)
Space and water heating			293.6338 (265)
Pumps, fans and electric keep-hot	161.7149	0.1387	22.4318 (267)
Energy for lighting	802.1707	0.1443	115.7780 (268)
Total CO2, kg/year			431.8437 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	412.8780	1.5867	655.1046 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1617.9030	1.5215	2461.7111 (278)
Space and water heating			3116.8157 (279)
Pumps, fans and electric keep-hot	161.7149	1.5128	244.6423 (281)
Energy for lighting	802.1707	1.5338	1230.3963 (282)
Total Primary energy kWh/year			4591.8542 (286)
Dwelling Primary energy Rate (DPER)			49.2200 (287)

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

1. Overall dwelling characteristics

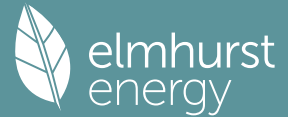
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	46.6500 (1b)	x 2.5000 (2b)	= 116.6250 (1b) - (3b)
First floor	46.6500 (1c)	x 2.2200 (2c)	= 103.5630 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 220.1880 (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) = 0.1362 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3862 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3862 (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)

Full SAP Calculation Printout



Adj infilt rate	0.4925	0.4828	0.4732	0.4249	0.4152	0.3669	0.3669	0.3573	0.3862	0.4152	0.4345	0.4538 (22b)
Effective ac	0.6213	0.6166	0.6119	0.5903	0.5862	0.5673	0.5673	0.5638	0.5746	0.5862	0.5944	0.6030 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.8500	1.1450	10.1336		(27)
TER Roof Light			1.3000	1.5918	2.6287		(27a)
Heatloss Floor 1			43.6500	0.1300	5.6745		(28a)
External Wall 1	129.8700	10.7400	119.1300	0.1800	21.4434		(29a)
pitched roof	67.9600	1.3000	66.6600	0.1100	7.3326		(30)
Total net area of external elements Aum(A, m2)			241.4800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.1028		(33)

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

427.9657 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	16.6800	0.0900	1.5012
E5 Ground floor (normal)	28.0000	0.1600	4.4800
E6 Intermediate floor within a dwelling	28.0000	0.0000	0.0000
E13 Gable (insulation at rafter level)	14.6100	0.0800	1.1688
E11 Eaves (insulation at rafter level)	18.6200	0.0400	0.7448
R4 Ridge (vaulted ceiling)	9.3100	0.0800	0.7448
E2 Other lintels (including other steel lintels)	7.1300	0.0500	0.3565
E3 Sill	6.2300	0.0500	0.3115
E4 Jamb	27.9000	0.0500	1.3950

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

10.7026 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 59.8054 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	45.1421	44.7999	44.4646	42.8894	42.5946	41.2227	41.2227	40.9686	41.7511	42.5946	43.1909	43.8142 (38)
Heat transfer coeff	104.9475	104.6053	104.2699	102.6947	102.4000	101.0280	101.0280	100.7740	101.5565	102.4000	102.9962	103.6195 (39)
Average = Sum(39)m / 12 =												102.6933

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1248	1.1212	1.1176	1.1007	1.0975	1.0828	1.0828	1.0801	1.0885	1.0975	1.1039	1.1106 (40)
HLP (average)												1.1007
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6682 (42)
Hot water usage for mixer showers											
68.9575	67.9212	66.4112	63.5219	61.3897	59.0118	57.6603	59.1589	60.8017	63.3548	66.3061	68.6933 (42a)
Hot water usage for baths											
29.7772	29.3350	28.7122	27.5640	26.7042	25.7508	25.2358	25.8542	26.5276	27.5477	28.7196	29.6766 (42b)
Hot water usage for other uses											
41.9555	40.4299	38.9042	37.3786	35.8529	34.3273	34.3273	35.8529	37.3786	38.9042	40.4299	41.9555 (42c)
Average daily hot water use (litres/day)											129.3261 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	140.6903	137.6861	134.0276	128.4644	123.9468	119.0899	117.2234	120.8661	124.7079	129.8067	135.4556	140.3254 (44)
Energy conte	222.8191	196.0632	205.9955	175.8614	166.8562	146.4349	141.7715	149.6575	153.7773	176.1465	192.9814	219.7157 (45)
Energy content (annual)										Total = Sum(45)m =		2148.0800
Distribution loss (46)m = 0.15 x (45)m												
	33.4229	29.4095	30.8993	26.3792	25.0284	21.9652	21.2657	22.4486	23.0666	26.4220	28.9472	32.9574 (46)

Water storage loss:

Store volume

300.0000 (47)

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

2.1127 (48)

Temperature factor from Table 2b

0.5400 (49)

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

1.1409 (55)

Total storage loss

35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 (56)

If cylinder contains dedicated solar storage

35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

281.4479 249.0183 264.6243 232.5989 225.4850 203.1725 200.4003 208.2863 210.5148 234.7753 249.7190 278.3445 (62)

WWHRS -31.5245 -27.8805 -29.1949 -24.1745 -22.5298 -19.2789 -18.0709 -19.2166 -19.9467 -23.5149 -26.6396 -30.9407 (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

249.9234 221.1377 235.4294 208.4244 202.9552 183.8936 182.3294 189.0697 190.5681 211.2604 223.0794 247.4038 (64)

12Total per year (kWh/year)

Total per year (kWh/year) = Sum(64)m = 2545.4745 (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)

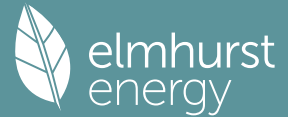
Heat gains from water heating, kWh/month

120.9904 107.5551 115.3965 103.8640 102.3827 94.0797 94.0421 96.6642 96.5210 105.4718 109.5564 119.9585 (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	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125	133.4125 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.3712	154.3038	139.3712	144.0169	139.3712	144.0169	139.3712	139.3712	144.0169	139.3712	144.0169	139.3712 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.0196	247.5621	241.1550	227.5151	210.2970	194.1145	183.3036	180.7611	187.1682	200.8082	218.0262	234.2087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412	36.3412 (69)

Full SAP Calculation Printout



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)											
Water heating gains (Table 5)	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300	-106.7300 (71)
Total internal gains	162.6215	160.0522	155.1029	144.2555	137.6112	130.6662	126.4006	129.9249	134.0569	141.7631	152.1616	161.2346 (72)
	613.0360	627.9419	601.6528	581.8112	553.3031	531.8213	512.0991	513.0809	528.2657	547.9662	580.2284	600.8382 (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	
North						0.3400	10.6334	0.6300	0.7000	0.7700	1.1049 (74)	
East						2.8100	19.6403	0.6300	0.7000	0.7700	16.8665 (76)	
South						1.9500	46.7521	0.6300	0.7000	0.7700	27.8617 (78)	
West						3.7500	19.6403	0.6300	0.7000	0.7700	22.5087 (80)	
North						1.3000	26.0000	0.6300	0.7000	1.0000	13.4152 (82)	
Solar gains	81.7570	152.6304	238.0973	333.8575	402.0174	409.4848	390.6149	339.4830	271.9021	177.1822	100.5119	68.2118 (83)
Total gains	694.7930	780.5723	839.7501	915.6687	955.3205	941.3061	902.7141	852.5640	800.1678	725.1484	680.7403	669.0500 (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	105.6857	106.0314	106.3724	108.0040	108.3149	109.7858	109.7858	110.0626	109.2145	108.3149	107.6879	107.0401
alpha	8.0457	8.0688	8.0915	8.2003	8.2210	8.3191	8.3191	8.3375	8.2810	8.2210	8.1792	8.1360
util living area	0.9996	0.9989	0.9962	0.9771	0.8901	0.6771	0.4917	0.5422	0.8245	0.9861	0.9988	0.9997 (86)
MIT	20.2198	20.3328	20.5016	20.7427	20.9246	20.9932	20.9995	20.9990	20.9697	20.7411	20.4443	20.2083 (87)
Th 2	19.9806	19.9836	19.9865	20.0003	20.0028	20.0149	20.0149	20.0171	20.0102	20.0028	19.9976	19.9922 (88)
util rest of house	0.9994	0.9983	0.9937	0.9623	0.8330	0.5785	0.3821	0.4273	0.7315	0.9741	0.9979	0.9996 (89)
MIT 2	19.0806	19.2276	19.4451	19.7548	19.9511	20.0125	20.0148	20.0169	19.9961	19.7594	19.3820	19.0751 (90)
Living area fraction	19.2883	19.4291	19.6377	19.9349	20.1286	20.1913	20.1943	20.1960	20.1736	19.9384	19.5757	19.2817 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2883	19.4291	19.6377	19.9349	20.1286	20.1913	20.1943	20.1960	20.1736	19.9384	19.5757	19.2817 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9992	0.9977	0.9925	0.9611	0.8412	0.5966	0.4021	0.4484	0.7484	0.9730	0.9974	0.9994 (94)
Useful gains	694.2512	778.8123	833.4799	880.0495	803.5957	561.6202	363.0181	382.2728	598.8260	705.5949	678.9625	668.6651 (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	1572.9796	1519.8237	1369.8649	1133.2236	863.0899	564.8761	363.1294	382.5373	616.8113	956.2502	1284.9467	1562.7603 (97)
Space heating kWh	653.7739	497.9597	399.0705	182.2853	44.2637	0.0000	0.0000	0.0000	0.0000	186.4876	436.3086	665.2069 (98a)
Space heating requirement - total per year (kWh/year)												3065.3562
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	653.7739	497.9597	399.0705	182.2853	44.2637	0.0000	0.0000	0.0000	0.0000	186.4876	436.3086	665.2069 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3065.3562
Space heating per m2										(98c) / (4) =		32.8548 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	653.7739	497.9597	399.0705	182.2853	44.2637	0.0000	0.0000	0.0000	0.0000	186.4876	436.3086	665.2069 (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)	708.3141	539.5013	432.3624	197.4922	47.9563	0.0000	0.0000	0.0000	0.0000	202.0450	472.7070	720.7008 (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	249.9234	221.1377	235.4294	208.4244	202.9552	183.8936	182.3294	189.0697	190.5681	211.2604	223.0794	247.4038 (64)
Efficiency of water heater (217)m	86.1141	85.8234	85.2332	83.7607	81.2749	79.8000	79.8000	79.8000	79.8000	83.7812	85.5363	79.8000 (216)
Fuel for water heating, kWh/month	290.2237	257.6660	276.2179	248.8333	249.7146	230.4431	228.4830	236.9294	238.8072	252.1572	260.8008	287.1262 (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	28.9586	23.2316	20.9175	15.3251	11.8375	9.6714	10.7986	14.0364	18.2319	23.9213	27.0190	29.7634 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-43.0391	-60.3505	-86.2597	-96.3920	-103.4061	-96.2956	-95.0965	-90.0512	-81.0455	-68.7450	-47.1994	-37.2476 (233a)

Full SAP Calculation Printout



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	-25.2657	-53.0577	-105.3034	-157.9452	-208.6518	-209.6040	-207.1436	-175.4704	-128.7202	-75.8082	-33.7083	-19.9864	(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												3321.0793	(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												3057.4023	(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)												233.7123	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2305.7932	(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												4392.4007	(238)

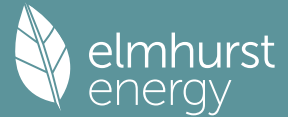
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3321.0793	0.2100	697.4266	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3057.4023	0.2100	642.0545	(264)
Space and water heating			1339.4811	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	233.7123	0.1443	33.7319	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-905.1282	0.1347	-121.9351	
PV Unit electricity exported	-1400.6650	0.1259	-176.3916	
Total			-298.3267	(269)
Total CO2, kg/year			1086.8156	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6500	(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	3321.0793	1.1300	3752.8196	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3057.4023	1.1300	3454.8646	(278)
Space and water heating			7207.6842	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	233.7123	1.5338	358.4757	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-905.1282	1.4979	-1355.7864	
PV Unit electricity exported	-1400.6650	0.4623	-647.4806	
Total			-2003.2670	(283)
Total Primary energy kWh/year			5692.9937	(286)
Target Primary Energy Rate (TPER)			61.0200	(287)

Full SAP Calculation Printout



Property Reference	Plot 3,16				Issued on Date	07/11/2025	
Assessment Reference	00001			Prop Type Ref			
Property							
SAP Rating	81 B		DER	3.86		TER	10.05
Environmental	96 A		% DER < TER				61.59
CO ₂ Emissions (t/year)	0.51		DFEE	40.46		TFEE	43.47
Compliance Check	See BREL		% DFEE < TFEE				6.93
% DPER < TPER	22.23		DPER	40.85		TPER	52.53
Assessor Details	Ms. Vanessa Vienna					Assessor ID	T798-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	65.6200 (1b)	x 2.5000 (2b)	= 164.0500 (1b) - (3b)
First floor	53.9000 (1c)	x 2.6000 (2c)	= 140.1400 (1c) - (3c)
Second floor	23.9200 (1d)	x 2.7300 (2d)	= 65.3016 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 369.4916 (5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												83.7000 (23c)
Effective ac	0.2584	0.2549	0.2515	0.2341	0.2307	0.2133	0.2133	0.2098	0.2202	0.2307	0.2376	0.2445 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			13.9100	1.1450	15.9275		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			37.0400	1.1450	42.4122		(27a)
Heatloss Floor 1			65.6200	0.1000	6.5620	110.0000	(28a)
External Wall 1	134.1100	15.8000	118.3100	0.1300	15.3803	190.0000	(29a)
pitched roof	50.5700	37.0400	13.5300	0.1000	1.3530	9.0000	(30)
Roof 2	31.0000		31.0000	0.1000	3.1000	9.0000	(30)
Total net area of external elements A _{um} (A, m ²)			281.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.0030		(33)
Main dwelling							
Party Wall 1			58.1100	0.0000	0.0000	0.0000	(32)
Internal Wall 1			46.1000			9.0000	(32c)
Internal Floor 1			53.8700			18.0000	(32d)

Full SAP Calculation Printout



Internal Floor 2	23.9000	18.0000	430.2000 (32d)
Internal Ceiling 1	53.8700	9.0000	484.8300 (32e)
Internal Ceiling 2	23.9400	9.0000	215.4600 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 32612.9201 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 227.3628 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	16.6800	0.0900	1.5012
E5 Ground floor (normal)	24.9600	0.1600	3.9936
E6 Intermediate floor within a dwelling	24.9600	0.0700	1.7472
E13 Gable (insulation at rafter level)	2.7900	0.0400	0.1116
R8 Roof to wall (rafter)	27.2000	0.1200	3.2640
R4 Ridge (vaulted ceiling)	10.9000	0.1200	1.3080
E24 Eaves (insulation at ceiling level - inverted)	11.8000	0.1500	1.7700
E12 Gable (insulation at ceiling level)	13.2000	0.2500	3.3000
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.4800	4.1760
P1 Party wall - Ground floor	9.3000	0.3200	2.9760
E18 Party wall between dwellings	11.3000	0.0600	0.6780
P4 Party wall - Roof (insulation at ceiling level)	3.1200	0.4800	1.4976
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
R6 Flat ceiling	11.6000	0.1200	1.3920
E2 Other lintels (including other steel lintels)	10.7300	0.2000	2.1460
E3 Sill	9.8300	0.0400	0.3932
E4 Jamb	26.7400	0.0500	1.3370

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 31.1414 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 118.1444 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	31.5081	31.0851	30.6621	28.5474	28.1244	26.0097	26.0097	25.5867	26.8556	28.1244	28.9703	29.8162 (38)
Average = Sum(39)m / 12 =	149.6524	149.2295	148.8065	146.6918	146.2688	144.1541	144.1541	143.7311	145.0000	146.2688	147.1147	147.9606 (39)
HLP	1.0433	1.0404	1.0374	1.0227	1.0197	1.0050	1.0050	1.0020	1.0109	1.0197	1.0256	1.0315 (40)
HLP (average)												1.0219
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

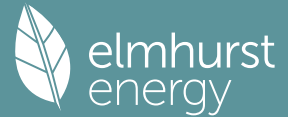
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9234 (42)
Hot water usage for mixer showers	73.2351	72.1345	70.5307	67.4622	65.1977	62.6724	61.2370	62.8286	64.5734	67.2848	70.4192	72.9545 (42a)
Hot water usage for baths	31.6167	31.1471	30.4859	29.2667	28.3538	27.3415	26.7948	27.4514	28.1663	29.2495	30.4938	31.5098 (42b)
Hot water usage for other uses	44.5682	42.9475	41.3269	39.7062	38.0855	36.4649	36.4649	38.0855	39.7062	41.3269	42.9475	44.5682 (42c)
Average daily hot water use (litres/day)												137.3505 (43)
Daily hot water use	149.4200	146.2292	142.3435	136.4352	131.6371	126.4788	124.4967	128.3655	132.4458	137.8611	143.8605	149.0325 (44)
Energy conte	236.6447	208.2284	218.7767	186.7729	177.2088	155.5205	150.5679	158.9434	163.3190	187.0762	204.9556	233.3489 (45)
Energy content (annual)										Total = Sum(45)m =		2281.3630
Distribution loss (46)m = 0.15 x (45)m	35.4967	31.2343	32.8165	28.0159	26.5813	23.3281	22.5852	23.8415	24.4978	28.0614	30.7433	35.0023 (46)
Water storage loss:												300.0000 (47)
Store volume												2.0800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.6000 (49)
Temperature factor from Table 2b												1.2480 (55)
Enter (49) or (54) in (55)												
Total storage loss	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880 (56)
If cylinder contains dedicated solar storage	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880 (57)
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612 (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	306.4939	271.3180	288.6259	254.3689	247.0580	215.4725	212.5183	220.8938	223.2710	256.9254	272.5516	303.1981 (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	306.4939	271.3180	288.6259	254.3689	247.0580	215.4725	212.5183	220.8938	223.2710	256.9254	272.5516	303.1981 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3072.6954 (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	134.5637	119.7076	128.6226	116.1788	114.8013	99.6722	99.6242	102.4090	102.2652	118.0822	122.2246	133.4679 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0191	174.9497	158.0191	163.2864	158.0191	163.2864	158.0191	158.0191	163.2864	158.0191	163.2864	158.0191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	313.2905	316.5414	308.3491	290.9085	268.8930	248.2015	234.3783	231.1273	239.3196	256.7602	278.7757	299.4673 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168 (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)	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346 (71)
Water heating gains (Table 5)	180.8652	178.1363	172.8798	161.3594	154.3028	138.4336	133.9034	137.6465	142.0349	158.7126	169.7563	179.3923 (72)
Total internal gains	719.0252	736.4779	706.0985	682.4048	648.0654	616.7719	593.1512	593.6433	611.4914	640.3424	678.6689	703.7291 (73)

Full SAP Calculation Printout



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			

North				1.9500	10.6334	0.5500	0.7000	0.7700	5.5322 (74)			
South				11.9600	46.7521	0.5500	0.7000	0.7700	149.1853 (78)			
North				36.2400	26.0000	0.5500	0.7000	1.0000	326.4862 (82)			
South				0.8000	26.0000	0.5500	0.7000	1.0000	7.2072 (82)			

Solar gains	488.4109	947.9548	1561.2929	2305.7672	2869.6217	2961.2426	2809.2107	2380.5358	1822.6670	1123.1824	607.1940	403.0433 (83)
Total gains	1207.4361	1684.4328	2267.3914	2988.1720	3517.6870	3578.0145	3402.3619	2974.1791	2434.1584	1763.5248	1285.8629	1106.7724 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.5346	60.7061	60.8787	61.7563	61.9349	62.8435	62.8435	63.0284	62.4769	61.9349	61.5788	61.2267
alpha	5.0356	5.0471	5.0586	5.1171	5.1290	5.1896	5.1896	5.2019	5.1651	5.1290	5.1053	5.0818
util living area	0.9866	0.9436	0.8136	0.5765	0.3849	0.2577	0.1864	0.2222	0.4086	0.7694	0.9631	0.9908 (86)
Living	20.1320	20.4369	20.7455	20.9071	20.9356	20.9399	20.9402	20.9403	20.9363	20.8378	20.4402	20.0805
Non living	19.0428	19.4222	19.7816	19.9590	19.9866	20.0024	20.0025	20.0051	19.9952	19.9009	19.4421	18.9856
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	20.5559	20.4369	20.7455	20.9071	20.9356	20.9399	20.9402	20.9403	20.9363	20.8378	20.4402	20.2091 (87)
Th 2	20.0474	20.0498	20.0523	20.0645	20.0669	20.0792	20.0792	20.0816	20.0743	20.0669	20.0620	20.0572 (88)
util rest of house	0.9829	0.9306	0.7825	0.5364	0.3469	0.2207	0.1474	0.1779	0.3548	0.7221	0.9521	0.9883 (89)
MIT 2	19.6469	19.4222	19.7816	19.9590	19.9866	20.0024	20.0025	20.0051	19.9952	19.9009	19.4421	19.1787 (90)
Living area fraction									fLA = Living area / (4) =			0.2277 (91)
MIT	19.8539	19.6532	20.0011	20.1748	20.2027	20.2158	20.2160	20.2181	20.2094	20.1142	19.6694	19.4133 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8539	19.6532	20.0011	20.1748	20.2027	20.2158	20.2160	20.2181	20.2094	20.1142	19.6694	19.4133 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9820	0.9242	0.7807	0.5412	0.3524	0.2262	0.1532	0.1845	0.3627	0.7246	0.9465	0.9860 (94)
Useful gains	1185.7017	1556.6999	1770.0855	1617.1459	1239.7853	809.2652	521.2415	548.7079	882.8181	1277.8975	1217.0766	1091.3110 (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	2327.6771	2201.6137	2009.0467	1653.9277	1243.6756	809.5454	521.2676	548.7760	885.8684	1391.6321	1849.1423	2250.9699 (97)
Space heating kWh	849.6297	433.3821	177.7871	26.4829	2.8944	0.0000	0.0000	0.0000	0.0000	84.6185	455.0873	862.7862 (98a)
Space heating requirement - total per year (kWh/year)												2892.6682
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	849.6297	433.3821	177.7871	26.4829	2.8944	0.0000	0.0000	0.0000	0.0000	84.6185	455.0873	862.7862 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2892.6682
Space heating per m2										(98c) / (4) =		20.1664 (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 %)												378.5966 (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	849.6297	433.3821	177.7871	26.4829	2.8944	0.0000	0.0000	0.0000	0.0000	84.6185	455.0873	862.7862 (98)
Space heating efficiency (main heating system 1)	378.5966	378.5966	378.5966	378.5966	378.5966	0.0000	0.0000	0.0000	0.0000	378.5966	378.5966	378.5966 (210)
Space heating fuel (main heating system)	224.4156	114.4707	46.9595	6.9950	0.7645	0.0000	0.0000	0.0000	0.0000	22.3506	120.2038	227.8906 (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	306.4939	271.3180	288.6259	254.3689	247.0580	215.4725	212.5183	220.8938	223.2710	256.9254	272.5516	303.1981 (64)
Efficiency of water heater (217)m	177.7219	177.7219	177.7219	177.7219	177.7219	177.7219	177.7219	177.7219	177.7219	177.7219	177.7219	177.7219 (216)
Fuel for water heating, kWh/month	172.4570	152.6644	162.4031	143.1275	139.0138	121.2414	119.5791	124.2918	125.6294	144.5660	153.3585	170.6025 (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	34.8397	31.4681	34.8397	33.7159	34.8397	33.7159	34.8397	34.8397	33.7159	34.8397	33.7159	34.8397 (231)
Lighting	112.6935	90.4069	81.4014	59.6382	46.0662	37.6365	42.0232	54.6233	70.9503	93.0906	105.1456	115.8256 (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)

Full SAP Calculation Printout



Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													764.0502	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													177.7219	
Water heating fuel used													1728.9346	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)														
mechanical ventilation fans (SFP = 0.9100)													410.2096	(230a)
Total electricity for the above, kWh/year													410.2096	(231)
Electricity for lighting (calculated in Appendix L)													909.5014	(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													3812.6958	(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	764.0502	0.1590	121.5177	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1728.9346	0.1411	243.8976	(264)
Space and water heating			365.4152	(265)
Pumps, fans and electric keep-hot	410.2096	0.1387	56.9011	(267)
Energy for lighting	909.5014	0.1443	131.2692	(268)
Total CO2, kg/year			553.5855	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8600	(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	764.0502	1.5886	1213.7665	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1728.9346	1.5216	2630.8002	(278)
Space and water heating			3844.5667	(279)
Pumps, fans and electric keep-hot	410.2096	1.5128	620.5651	(281)
Energy for lighting	909.5014	1.5338	1395.0236	(282)
Total Primary energy kWh/year			5860.1554	(286)
Dwelling Primary energy Rate (DPER)			40.8500	(287)

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

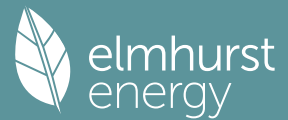
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Main dwelling				
Ground floor	65.6200 (1b)	x 2.5000 (2b)	= 164.0500 (1b) - (3b)	
First floor	53.9000 (1c)	x 2.6000 (2c)	= 140.1400 (1c) - (3c)	
Second floor	23.9200 (1d)	x 2.7300 (2d)	= 65.3016 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	143.4400		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	369.4916 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1083 (8)
Pressure test		Yes

Full SAP Calculation Printout



Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3583 (18)
1 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor
(20) = 1 - [0.075 x (19)] = 0.9250 (20)
(21) = (18) x (20) = 0.3314 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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													
Effective ac	0.4225	0.4142	0.4059	0.3645	0.3562	0.3148	0.3148	0.3065	0.3314	0.3562	0.3728	0.3894	(22b)
	0.5893	0.5858	0.5824	0.5664	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			9.2700	1.1450	10.6145			(27)
TER Roof Light			24.7000	1.5918	49.9449			(27a)
Heatloss Floor 1			65.6200	0.1300	8.5306			(28a)
External Wall 1	134.1100	11.1600	122.9500	0.1800	22.1310			(29a)
pitched roof	50.5700	24.7000	25.8700	0.1100	2.8457			(30)
Roof 2	31.0000		31.0000	0.1100	3.4100			(30)
Total net area of external elements Aum(A, m2)			281.3000					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Main dwelling								
Party Wall 1			58.1100	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								227.3628 (35)

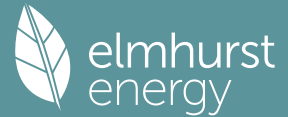
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	16.6800	0.0900	1.5012	
E16 Corner (normal)	24.9600	0.1600	3.9936	
E5 Ground floor (normal)	24.9600	0.0000	0.0000	
E6 Intermediate floor within a dwelling	2.7900	0.0800	0.2232	
E13 Gable (insulation at rafter level)	27.2000	0.0600	1.6320	
R8 Roof to wall (rafter)	10.9000	0.0800	0.8720	
R4 Ridge (vaulted ceiling)	11.8000	0.2400	2.8320	
E24 Eaves (insulation at ceiling level - inverted)	13.2000	0.0600	0.7920	
E12 Gable (insulation at ceiling level)	8.7000	0.0800	0.6960	
P5 Party wall - Roof (insulation at rafter level)	9.3000	0.0800	0.7440	
P1 Party wall - Ground floor	11.3000	0.0600	0.6780	
E18 Party wall between dwellings	3.1200	0.1200	0.3744	
P4 Party wall - Roof (insulation at ceiling level)	5.0000	-0.0900	-0.4500	
E17 Corner (inverted - internal area greater than external area)	11.6000	0.0600	0.6960	
R6 Flat ceiling	10.7300	0.0500	0.5365	
E2 Other lintels (including other steel lintels)	9.8300	0.0500	0.4915	
E3 Sill	26.7400	0.0500	1.3370	
E4 Jamb				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.9494	(36)
Point Thermal bridges			0.0000	(36a)
Total fabric heat loss			116.3161	(37)
				(33) + (36) + (36a) =

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	71.8499	71.4273	71.0130	69.0673	68.7032	67.0085	67.0085	66.6947	67.6613	68.7032	69.4397	70.2096	(38)
Average = Sum(39)m / 12 =	188.1660	187.7434	187.3291	185.3833	185.0193	183.3246	183.3246	183.0107	183.9773	185.0193	185.7557	186.5257	(39)
												185.3816	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3118	1.3089	1.3060	1.2924	1.2899	1.2781	1.2781	1.2759	1.2826	1.2899	1.2950	1.3004	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9234 (42)
Hot water usage for mixer showers													
Hot water usage for baths	73.2351	72.1345	70.5307	67.4622	65.1977	62.6724	61.2370	62.8286	64.5734	67.2848	70.4192	72.9545	(42a)
Hot water usage for other uses	31.6167	31.1471	30.4859	29.2667	28.3538	27.3415	26.7948	27.4514	28.1663	29.2495	30.4938	31.5098	(42b)
Average daily hot water use (litres/day)	44.5682	42.9475	41.3269	39.7062	38.0855	36.4649	36.4649	38.0855	39.7062	41.3269	42.9475	44.5682	(42c)
												137.3505	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.4200	146.2292	142.3435	136.4352	131.6371	126.4788	124.4967	128.3655	132.4458	137.8611	143.8605	149.0325	(44)
Energy content (annual)	236.6447	208.2284	218.7767	186.7729	177.2088	155.5205	150.5679	158.9434	163.3190	187.0762	204.9556	233.3489	(45)
Distribution loss (46)m = 0.15 x (45)m	35.4967	31.2343	32.8165	28.0159	26.5813	23.3281	22.5852	23.8415	24.4978	28.0614	30.7433	35.0023	(46)
Water storage loss:													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.1127 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1409 (55)
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	295.2735	261.1834	277.4055	243.5105	235.8377	212.2581	209.1967	217.5722	220.0565	245.7050	261.6932	291.9777	(62)
WWHRS	-33.4800	-29.6100	-31.0059	-25.6741	-23.9273	-20.4748	-19.1919	-20.4086	-21.1840	-24.9736	-28.2921	-32.8600	(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													

Full SAP Calculation Printout



261.7935	231.5734	246.3996	217.8364	211.9103	191.7833	190.0049	197.1636	198.8725	220.7314	233.4011	259.1177 (64)
Total per year (kWh/year) = Sum(64)m =											2660.5877 (64)
Electric shower(s)											2661 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month											
125.5874	111.6000	119.6463	107.4920	105.8250	97.1006	96.9669	99.7517	99.6936	109.1059	113.5378	124.4915 (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	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683	146.1683 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	158.0191	174.9497	158.0191	163.2864	158.0191	163.2864	158.0191	158.0191	163.2864	158.0191	163.2864	158.0191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	313.2905	316.5414	308.3491	290.9085	268.8930	248.2015	234.3783	231.1273	239.3196	256.7602	278.7757	299.4673 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168	37.6168 (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)												
	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346	-116.9346 (71)
Water heating gains (Table 5)												
	168.8003	166.0714	160.8149	149.2945	142.2379	134.8620	130.3318	134.0749	138.4633	146.6477	157.6914	167.3273 (72)
Total internal gains												
	709.9603	727.4130	697.0336	673.3399	639.0004	613.2003	589.5796	590.0717	607.9198	631.2774	669.6040	694.6642 (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			
North		1.3000	10.6334		0.6300	0.7000		0.7700		4.2246 (74)			
South		7.9700	46.7521		0.6300	0.7000		0.7700		113.8757 (78)			
North		24.1700	26.0000		0.6300	0.7000		1.0000		249.4199 (82)			
South		0.5300	26.0000		0.6300	0.7000		1.0000		5.4693 (82)			
Solar gains		372.9895	723.9577	1192.4147	1761.0522	2191.7385	2261.7291	2145.6055	1818.1722	1392.0553	857.7934	463.7063	307.7929 (83)
Total gains		1082.9498	1451.3707	1889.4483	2434.3921	2830.7389	2874.9294	2735.1851	2408.2440	1999.9751	1489.0709	1133.3103	1002.4571 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.1444	48.2528	48.3595	48.8671	48.9632	49.4159	49.4159	49.5006	49.2405	48.9632	48.7691	48.5678
alpha	4.2096	4.2169	4.2240	4.2578	4.2642	4.2944	4.2944	4.3000	4.2827	4.2642	4.2513	4.2379
util living area												
	0.9926	0.9759	0.9227	0.7753	0.5771	0.4029	0.2938	0.3471	0.5983	0.8977	0.9828	0.9946 (86)
MIT												
	19.3870	19.7461	20.2401	20.7214	20.9318	20.9883	20.9976	20.9953	20.9429	20.5397	19.8509	19.3294 (87)
Th 2												
	19.8316	19.8339	19.8362	19.8468	19.8488	19.8581	19.8581	19.8598	19.8545	19.8488	19.8447	19.8405 (88)
util rest of house												
	0.9903	0.9690	0.9024	0.7298	0.5150	0.3332	0.2181	0.2623	0.5124	0.8618	0.9768	0.9929 (89)
MIT 2												
	17.9795	18.4341	19.0412	19.5930	19.7987	19.8521	19.8574	19.8583	19.8204	19.4185	18.5789	17.9121 (90)
Living area fraction												
									fLA = Living area / (4) =			0.2277 (91)
MIT												
	18.2999	18.7329	19.3142	19.8499	20.0567	20.1108	20.1170	20.1172	20.0760	19.6738	18.8685	18.2348 (92)
Temperature adjustment												
												0.0000
adjusted MIT												
	18.2999	18.7329	19.3142	19.8499	20.0567	20.1108	20.1170	20.1172	20.0760	19.6738	18.8685	18.2348 (93)

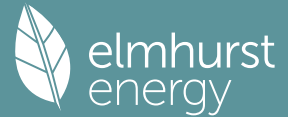
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9859	0.9602	0.8915	0.7300	0.5266	0.3488	0.2354	0.2816	0.5298	0.8552	0.9695	0.9894 (94)
Useful gains	1067.6832	1393.5410	1684.3942	1777.0612	1490.6203	1002.8955	643.7586	678.1517	1059.5794	1273.5017	1098.7898	991.8015 (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												
	2634.3126	2597.0294	2400.4708	2029.9267	1546.1470	1010.2687	644.7534	680.2813	1099.4446	1678.8304	2186.0646	2617.8583 (97)
Space heating kWh												
	1165.5723	808.7442	532.7610	182.0632	41.3119	0.0000	0.0000	0.0000	0.0000	301.5645	782.8379	1209.7863 (98a)
Space heating requirement - total per year (kWh/year)												5024.6411
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												
	1165.5723	808.7442	532.7610	182.0632	41.3119	0.0000	0.0000	0.0000	0.0000	301.5645	782.8379	1209.7863 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5024.6411
Space heating per m2												(98c) / (4) = 35.0296 (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												
	1165.5723	808.7442	532.7610	182.0632	41.3119	0.0000	0.0000	0.0000	0.0000	301.5645	782.8379	1209.7863 (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)

Full SAP Calculation Printout



Space heating fuel (main heating system)	1262.8086	876.2125	577.2058	197.2516	44.7583	0.0000	0.0000	0.0000	0.0000	326.7221	848.1450	1310.7110	(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	261.7935	231.5734	246.3996	217.8364	211.9103	191.7833	190.0049	197.1636	198.8725	220.7314	233.4011	259.1177	(64)
Efficiency of water heater	87.0004	86.6253	85.7419	83.6603	81.1417	79.8000	79.8000	79.8000	79.8000	84.7600	86.5579	79.8000	(216)
Fuel for water heating, kWh/month	300.9108	267.3278	287.3735	260.3820	261.1609	240.3299	238.1014	247.0721	249.2137	260.4192	269.6474	297.6045	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	32.8332	26.3400	23.7163	17.3756	13.4214	10.9654	12.2434	15.9145	20.6713	27.1219	30.6342	33.7458	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-58.7792	-81.5674	-115.3998	-127.5877	-135.6979	-125.8762	-124.1821	-118.0563	-107.1071	-92.0981	-64.1000	-50.9601	(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	-37.3014	-77.9578	-154.0615	-230.1745	-303.2569	-304.4160	-300.9626	-255.4383	-187.9588	-111.2371	-49.7084	-29.5478	(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												5443.8149	(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												3179.5433	(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)												264.9831	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3243.4330	(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												5730.9082	(238)

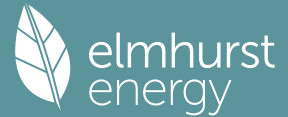
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5443.8149	0.2100	1143.2011 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3179.5433	0.2100	667.7041 (264)
Space and water heating			1810.9052 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	264.9831	0.1443	38.2452 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1201.4120	0.1350	-162.1348
PV Unit electricity exported	-2042.0211	0.1260	-257.3809
Total			-419.5157 (269)
Total CO2, kg/year			1441.5640 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0500 (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	5443.8149	1.1300	6151.5108 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3179.5433	1.1300	3592.8839 (278)
Space and water heating			9744.3947 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	264.9831	1.5338	406.4399 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1201.4120	1.4988	-1800.6596
PV Unit electricity exported	-2042.0211	0.4627	-944.7768
Total			-2745.4364 (283)
Total Primary energy kWh/year			7535.4990 (286)
Target Primary Energy Rate (TPER)			52.5300 (287)

Full SAP Calculation Printout



Property Reference	Plot 4, 6, 8, 12, 14				Issued on Date	07/11/2025		
Assessment Reference	00001			Prop Type Ref				
Property								
SAP Rating	80 C		DER	4.34		TER	10.16	
Environmental	96 A		% DER < TER				57.28	
CO ₂ Emissions (t/year)	0.48		DFEE	40.53		TFEE	39.20	
Compliance Check	See BREL		% DFEE < TFEE				-3.40	
% DPER < TPER	13.10		DPER	45.99		TPER	52.92	
Assessor Details	Ms. Vanessa Vienna					Assessor ID	T798-0001	
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	48.3600 (1b)	x 2.5000 (2b)	= 120.9000 (1b) - (3b)
First floor	48.3900 (1c)	x 2.6100 (2c)	= 126.2979 (1c) - (3c)
Second floor	21.5000 (1d)	x 2.5900 (2d)	= 55.6850 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 302.8829 (5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												74.4000 (23c)
Effective ac	0.2906	0.2874	0.2842	0.2682	0.2651	0.2491	0.2491	0.2459	0.2555	0.2651	0.2714	0.2778 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			8.6200	1.1450	9.8702		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			37.0400	1.1450	42.4122		(27a)
Heatloss Floor 1			48.3600	0.1000	4.8360	110.0000	5319.6000 (28a)
External Wall 1	59.0200	10.5100	48.5100	0.1300	6.3063	190.0000	9216.9001 (29a)
pitched roof	45.3900	37.0400	8.3500	0.1000	0.8350	9.0000	75.1500 (30)
Roof 2	17.2000		17.2000	0.1000	1.7200	9.0000	154.8000 (30)
Total net area of external elements Aum(A, m ²)			169.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2477		(33)
Main dwelling							
Party Wall 1			116.2800	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall 1			38.0000			9.0000	342.0000 (32c)
Internal Floor 1			48.3600			18.0000	870.4800 (32d)

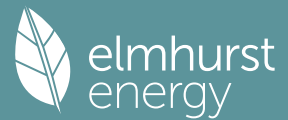
Internal Floor 2						21.5200						18.0000	387.3600 (32d)		
Internal Ceiling 1						48.3000						9.0000	434.7000 (32e)		
Internal Ceiling 2						21.0700						9.0000	189.6300 (32e)		
Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) =				16990.6201 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K														143.6839 (35)	
List of Thermal Bridges															
K1 Element									Length	Psi-value		Total			
E5 Ground floor (normal)									10.3900	0.1600		1.6624			
E6 Intermediate floor within a dwelling									10.3900	0.0700		0.7273			
R8 Roof to wall (rafter)									20.8000	0.1200		2.4960			
R4 Ridge (vaulted ceiling)									5.2000	0.1200		0.6240			
E24 Eaves (insulation at ceiling level - inverted)									10.6500	0.1500		1.5975			
P5 Party wall - Roof (insulation at rafter level)									17.4600	0.4800		8.3808			
P1 Party wall - Ground floor									18.6200	0.3200		5.9584			
E18 Party wall between dwellings									22.7000	0.0600		1.3620			
P4 Party wall - Roof (insulation at ceiling level)									6.5100	0.4800		3.1248			
E2 Other lintels (including other steel lintels)									6.8500	0.2000		1.3700			
E3 Sill									5.9500	0.0400		0.2380			
E4 Jamb									17.9000	0.0500		0.8950			
P2 Party wall - Intermediate floor within a dwelling									27.0300	0.0000		0.0000			
R6 Flat ceiling									10.3900	0.1200		1.2468			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														29.6830 (36)	
Point Thermal bridges														(36a) =	0.0000
Total fabric heat loss										(33) + (36) + (36a) =				97.9307 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)															
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	29.0421	28.7235	28.4049	26.8120	26.4934	24.9004	24.9004	24.5818	25.5376	26.4934	27.1305	27.7677	(38)		
Heat transfer coeff	126.9729	126.6543	126.3357	124.7427	124.4241	122.8311	122.8311	122.5125	123.4683	124.4241	125.0613	125.6985	(39)		
Average = Sum(39)m / 12 =														124.6630	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	1.0738	1.0711	1.0684	1.0549	1.0522	1.0387	1.0387	1.0360	1.0441	1.0522	1.0576	1.0630	(40)		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31			
													31		

4. Water heating energy requirements (kWh/year)															

Assumed occupancy														2.8563 (42)	
Hot water usage for mixer showers															
	72.1104	71.0268	69.4476	66.4262	64.1965	61.7100	60.2966	61.8638	63.5817	66.2515	69.3378	71.8342	(42a)		
Hot water usage for baths															
	31.1331	30.6707	30.0196	28.8191	27.9201	26.9233	26.3849	27.0315	27.7354	28.8020	30.0273	31.0278	(42b)		
Hot water usage for other uses															
	43.8813	42.2856	40.6899	39.0942	37.4986	35.9029	35.9029	37.4986	39.0942	40.6899	42.2856	43.8813	(42c)		
Average daily hot water use (litres/day)														135.2407 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Daily hot water use	147.1248	143.9831	140.1571	134.3395	129.6152	124.5362	122.5844	126.3938	130.4114	135.7435	141.6507	146.7433	(44)		
Energy conte	233.0097	205.0300	215.4163	183.9041	174.4870	153.1317	148.2552	156.5019	160.8103	184.2026	201.8074	229.7645	(45)		
Energy content (annual)															
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =				2246.3207	
	34.9515	30.7545	32.3124	27.5856	26.1730	22.9698	22.2383	23.4753	24.1215	27.6304	30.2711	34.4647	(46)		
Water storage loss:															
Store volume														300.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):														2.0800 (48)	
Temperature factor from Table 2b														0.6000 (49)	
Enter (49) or (54) in (55)														1.2480 (55)	
Total storage loss															
	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(56)		
If cylinder contains dedicated solar storage															
	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(57)		
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(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															
	302.8589	268.1196	285.2655	251.5001	244.3362	213.0837	210.2056	218.4523	220.7623	254.0518	269.4034	299.6137	(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															
	302.8589	268.1196	285.2655	251.5001	244.3362	213.0837	210.2056	218.4523	220.7623	254.0518	269.4034	299.6137	(64)		
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =				3037.6531 (64a)	
Electric shower(s)														3038 (64)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =														0.0000 (64a)	
Heat gains from water heating, kWh/month															
	133.3551	118.6441	127.5053	115.2249	113.8963	98.8779	98.8552	101.5972	101.4310	117.1267	121.1778	132.2761	(65)		

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.6992	157.9884	142.6992	147.4558	142.6992	147.4558	142.6992	142.6992	147.4558	142.6992	147.4558	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.9171	285.8529	278.4548	262.7051	242.8240	224.1385	211.6554	208.7196	216.1177	231.8674	251.7486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	(71)
Water heating gains (Table 5)	179.2407	176.5538	171.3781	160.0346	153.0864	137.3304	132.8699	136.5554	140.8764	157.4284	168.3025	(72)
Total internal gains	670.7014	686.2395	658.3765	636.0400	604.4539	574.7691	553.0689	553.8186	570.2944	597.8394	633.3513	(73)

Full SAP Calculation Printout



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			
North	1.3700				10.6334	0.5500	0.7000	0.7700	3.8867 (74)			
South	7.2500				46.7521	0.5500	0.7000	0.7700	90.4342 (78)			
North	36.2400				26.0000	0.5500	0.7000	1.0000	326.4862 (82)			
South	0.8000				26.0000	0.5500	0.7000	1.0000	7.2072 (82)			
Solar gains	428.0143	848.5912	1433.3834	2158.6580	2713.7067	2809.9451	2661.9214	1688.2077	1015.6579	535.5241	350.9052	(83)
Total gains	1098.7158	1534.8307	2091.7599	2794.6979	3318.1606	3384.7142	3214.9903	2793.3703	2258.5021	1613.4973	1168.8753	(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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	37.1703	37.2638	37.3578	37.8348	37.9317	38.4236	38.4236	38.5235	38.2253	37.9317	37.7384	37.5471
util living area	3.4780	3.4843	3.4905	3.5223	3.5288	3.5616	3.5616	3.5682	3.5484	3.5288	3.5159	3.5031
util living area	0.9483	0.8724	0.7232	0.5099	0.3432	0.2313	0.1679	0.2012	0.3697	0.6866	0.9026	0.9594 (86)
Living	19.7832	20.1786	20.5774	20.8237	20.8933	20.9100	20.9127	20.9121	20.8954	20.7168	20.1943	19.7107
Non living	18.6145	19.0989	19.5655	19.8416	19.9120	19.9379	19.9398	19.9419	19.9228	19.7435	19.1366	18.5310
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	20.3775	20.1786	20.5774	20.8237	20.8933	20.9100	20.9127	20.9121	20.8954	20.7168	20.1943	19.8910 (87)
Th 2	20.0223	20.0245	20.0267	20.0378	20.0401	20.0512	20.0512	20.0534	20.0467	20.0401	20.0356	20.0312 (88)
util rest of house	0.9395	0.8542	0.6932	0.4749	0.3092	0.1973	0.1318	0.1600	0.3210	0.6433	0.8850	0.9523 (89)
MIT 2	19.4611	19.0989	19.5655	19.8416	19.9120	19.9379	19.9398	19.9419	19.9228	19.7435	19.1366	18.8013 (90)
Living area fraction									fLA = Living area / (4) =			0.2432 (91)
MIT	19.6840	19.3615	19.8116	20.0805	20.1507	20.1743	20.1764	20.1778	20.1593	19.9802	19.3939	19.0664 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6840	19.3615	19.8116	20.0805	20.1507	20.1743	20.1764	20.1778	20.1593	19.9802	19.3939	19.0664 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1028.3941	1289.4312	1435.2862	1331.5611	1038.9504	682.8548	438.9779	462.1981	738.1472	1033.2734	1018.3082	950.7906 (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	1953.3476	1831.6158	1681.7267	1394.6830	1051.4663	684.6991	439.2943	462.8307	748.1348	1167.1219	1537.4867	1868.6790 (97)
Space heating kWh	688.1654	364.3480	183.3517	45.4478	9.3118	0.0000	0.0000	0.0000	0.0000	99.5833	373.8085	682.9090 (98a)
Space heating requirement - total per year (kWh/year)												2446.9256
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	688.1654	364.3480	183.3517	45.4478	9.3118	0.0000	0.0000	0.0000	0.0000	99.5833	373.8085	682.9090 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2446.9256
Space heating per m2										(98c) / (4) =		20.6928 (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 %)												365.3446 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	688.1654	364.3480	183.3517	45.4478	9.3118	0.0000	0.0000	0.0000	0.0000	99.5833	373.8085	682.9090 (98)
Space heating fuel (main heating system)	365.3446	365.3446	365.3446	365.3446	365.3446	0.0000	0.0000	0.0000	0.0000	365.3446	365.3446	365.3446 (210)
Space heating efficiency (main heating system 2)	188.3606	99.7272	50.1860	12.4397	2.5488	0.0000	0.0000	0.0000	0.0000	27.2574	102.3167	186.9219 (211)
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 (212)
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 (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	302.8589	268.1196	285.2655	251.5001	244.3362	213.0837	210.2056	218.4523	220.7623	254.0518	269.4034	299.6137 (64)
Efficiency of water heater	177.2907	177.2907	177.2907	177.2907	177.2907	177.2907	177.2907	177.2907	177.2907	177.2907	177.2907	177.2907 (216)
Fuel for water heating, kWh/month	170.8262	151.2316	160.9027	141.8575	137.8167	120.1889	118.5655	123.2170	124.5200	143.2968	151.9558	168.9957 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	28.5591	25.7953	28.5591	27.6379	28.5591	27.6379	28.5591	28.5591	27.6379	28.5591	27.6379	28.5591 (231)
Lighting	101.7680	81.6420	73.5096	53.8563	41.6001	33.9877	37.9490	49.3276	64.0717	84.0655	94.9518	104.5964 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	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)	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)	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)												

Full SAP Calculation Printout



(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												669.7583	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.2907	
Water heating fuel used												1713.3742	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)													
mechanical ventilation fans (SFP = 0.9100)												336.2606	(230a)
Total electricity for the above, kWh/year												336.2606	(231)
Electricity for lighting (calculated in Appendix L)												821.3258	(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												3540.7188	(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	669.7583	0.1584	106.0780	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1713.3742	0.1411	241.6924	(264)
Space and water heating			347.7704	(265)
Pumps, fans and electric keep-hot	336.2606	0.1387	46.6435	(267)
Energy for lighting	821.3258	0.1443	118.5427	(268)
Total CO2, kg/year			512.9566	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3400	(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	669.7583	1.5862	1062.3608	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1713.3742	1.5216	2607.0854	(278)
Space and water heating			3669.4462	(279)
Pumps, fans and electric keep-hot	336.2606	1.5128	508.6950	(281)
Energy for lighting	821.3258	1.5338	1259.7769	(282)
Total Primary energy kWh/year			5437.9181	(286)
Dwelling Primary energy Rate (DPER)			45.9900	(287)

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

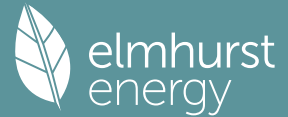
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	48.3600 (1b)	x 2.5000 (2b)	= 120.9000 (1b) - (3b)	
First floor	48.3900 (1c)	x 2.6100 (2c)	= 126.2979 (1c) - (3c)	
Second floor	21.5000 (1d)	x 2.5900 (2d)	= 55.6850 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	118.2500			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	302.8829	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1321	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3821	(18)

Full SAP Calculation Printout



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) = 0.3248 (21)

Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4141	0.4059	0.3978	0.3572	0.3491	0.3085	0.3085	0.3004	0.3248	0.3491	0.3653	0.3816 (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 Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			5.2100	1.1450	5.9656		(27)
TER Roof Light			22.4500	1.5918	45.3952		(27a)
Heatloss Floor 1			48.3600	0.1300	6.2868		(28a)
External Wall 1	59.0200	7.1000	51.9200	0.1800	9.3456		(29a)
pitched roof	45.3900	22.4500	22.9400	0.1100	2.5234		(30)
Roof 2	17.2000		17.2000	0.1100	1.8920		(30)
Total net area of external elements Aum(A, m2)			169.9700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	73.2987	(33)
Main dwelling							
Party Wall 1			116.2800	0.0000	0.0000		(32)

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

143.6839 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	10.3900	0.1600	1.6624
E6 Intermediate floor within a dwelling	10.3900	0.0000	0.0000
R8 Roof to wall (rafter)	20.8000	0.0600	1.2480
R4 Ridge (vaulted ceiling)	5.2000	0.0800	0.4160
E24 Eaves (insulation at ceiling level - inverted)	10.6500	0.2400	2.5560
P5 Party wall - Roof (insulation at rafter level)	17.4600	0.0800	1.3968
P1 Party wall - Ground floor	18.6200	0.0800	1.4896
E18 Party wall between dwellings	22.7000	0.0600	1.3620
P4 Party wall - Roof (insulation at ceiling level)	6.5100	0.1200	0.7812
E2 Other lintels (including other steel lintels)	6.8500	0.0500	0.3425
E3 Sill	5.9500	0.0500	0.2975
E4 Jamb	17.9000	0.0500	0.8950
P2 Party wall - Intermediate floor within a dwelling	27.0300	0.0000	0.0000
R6 Flat ceiling	10.3900	0.0600	0.6234

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

13.0704 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 86.3691 (37)

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

(38)m	Jan 58.5439	Feb 58.2112	Mar 57.8850	Apr 56.3532	May 56.0666	Jun 54.7325	Jul 54.7325	Aug 54.4854	Sep 55.2464	Oct 56.0666	Nov 56.6464	Dec 57.2526 (38)
Heat transfer coeff	144.9129	144.5802	144.2541	142.7223	142.4357	141.1016	141.1016	140.8545	141.6155	142.4357	143.0155	143.6216 (39)
Average = Sum(39)m / 12 =												142.7209

HLP	Jan 1.2255	Feb 1.2227	Mar 1.2199	Apr 1.2070	May 1.2045	Jun 1.1932	Jul 1.1932	Aug 1.1912	Sep 1.1976	Oct 1.2045	Nov 1.2094	Dec 1.2146 (40)
HLP (average)												1.2069
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.8563 (42)
Hot water usage for mixer showers											
72.1104	71.0268	69.4476	66.4262	64.1965	61.7100	60.2966	61.8638	63.5817	66.2515	69.3378	71.8342 (42a)
Hot water usage for baths											
31.1331	30.6707	30.0196	28.8191	27.9201	26.9233	26.3849	27.0315	27.7354	28.8020	30.0273	31.0278 (42b)
Hot water usage for other uses											
43.8813	42.2856	40.6899	39.0942	37.4986	35.9029	35.9029	37.4986	39.0942	40.6899	42.2856	43.8813 (42c)
Average daily hot water use (litres/day)											135.2407 (43)

Daily hot water use	Jan 147.1248	Feb 143.9831	Mar 140.1571	Apr 134.3395	May 129.6152	Jun 124.5362	Jul 122.5844	Aug 126.3938	Sep 130.4114	Oct 135.7435	Nov 141.6507	Dec 146.7433 (44)
Energy conte	233.0097	205.0300	215.4163	183.9041	174.4870	153.1317	148.2552	156.5019	160.8103	184.2026	201.8074	229.7645 (45)
Energy content (annual)										Total = Sum(45)m =		2246.3207
Distribution loss (46)m = 0.15 x (45)m	34.9515	30.7545	32.3124	27.5856	26.1730	22.9698	22.2383	23.4753	24.1215	27.6304	30.2711	34.4647 (46)

Water storage loss:

Store volume 300.0000 (47)

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

Temperature factor from Table 2b

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

Total storage loss 2.1127 (48)

35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 (56)

If cylinder contains dedicated solar storage 35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 291.6385 257.9850 274.0451 240.6417 233.1158 209.8693 206.8840 215.1308 217.5479 242.8314 258.5450 288.3933 (62)

WWHRS -32.9659 -29.1553 -30.5297 -25.2798 -23.5599 -20.1604 -18.8971 -20.0952 -20.8587 -24.5901 -27.8576 -32.3554 (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 258.6726 228.8297 243.5154 215.3618 209.5559 189.7089 187.9869 195.0355 196.6892 218.2413 230.6874 256.0379 (64)

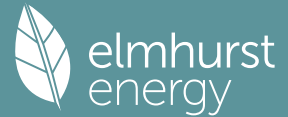
Total per year (kWh/year) = Sum(64)m = 2630.3225 (64)

12Total per year (kWh/year) 2630 (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)

Full SAP Calculation Printout



Heat gains from water heating, kWh/month
124.3788 110.5365 118.5290 106.5382 104.9200 96.3064 96.1979 98.9399 98.8595 108.1504 112.4910 123.2997 (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	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.6992	157.9884	142.6992	147.4558	142.6992	147.4558	142.6992	142.6992	147.4558	142.6992	147.4558	142.6992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.9171	285.8529	278.4548	262.7051	242.8240	224.1385	211.6554	208.7196	216.1177	231.8674	251.7486	270.4341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	(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)	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	(71)
Water heating gains (Table 5)	167.1758	164.4889	159.3131	147.9697	141.0215	133.7588	129.2983	132.9838	137.3048	145.3635	156.2375	165.7255	(72)
Total internal gains	661.6365	677.1746	649.3115	626.9750	595.3890	571.1975	549.4973	550.2470	566.7228	588.7745	624.2863	647.7031	(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
North				0.8200	10.6334		0.6300		0.7000		0.7700		2.6648 (74)
South				4.3900	46.7521		0.6300		0.7000		0.7700		62.7245 (78)
North				21.9700	26.0000		0.6300		0.7000		1.0000		226.7172 (82)
South				0.4800	26.0000		0.6300		0.7000		1.0000		4.9533 (82)
Solar gains	297.0598	588.9809	994.9077	1498.3553	1883.6375	1950.4410	1847.6939	1554.5117	1171.7947	704.9489	371.6806	243.5397	(83)
Total gains	958.6963	1266.1555	1644.2192	2125.3303	2479.0265	2521.6385	2397.1912	2104.7587	1738.5174	1293.7234	995.9669	891.2428	(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	32.5686	32.6436	32.7174	33.0685	33.1351	33.4484	33.4484	33.5070	33.3270	33.1351	33.0007	32.8615	
alpha	3.1712	3.1762	3.1812	3.2046	3.2090	3.2299	3.2299	3.2338	3.2218	3.2090	3.2000	3.1908	
util living area	0.9673	0.9284	0.8432	0.6780	0.4985	0.3497	0.2565	0.3031	0.5199	0.8112	0.9422	0.9733	(86)
MIT	19.0028	19.4573	20.0550	20.6156	20.8804	20.9713	20.9921	20.9865	20.9012	20.4190	19.5897	18.9263	(87)
Th 2	19.8997	19.9019	19.9041	19.9144	19.9164	19.9254	19.9254	19.9271	19.9219	19.9164	19.9125	19.9084	(88)
util rest of house	0.9610	0.9158	0.8185	0.6377	0.4487	0.2938	0.1949	0.2343	0.4507	0.7720	0.9297	0.9681	(89)
MIT 2	17.6003	18.1676	18.8934	19.5406	19.8162	19.9070	19.9220	19.9209	19.8511	19.3497	18.3495	17.5094	(90)
Living area fraction	17.9414	18.4813	19.1759	19.8020	20.0750	20.1658	20.1823	20.1801	20.1065	19.6097	18.6512	17.8540	(92)
MIT	17.9414	18.4813	19.1759	19.8020	20.0750	20.1658	20.1823	20.1801	20.1065	19.6097	18.6512	17.8540	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9414	18.4813	19.1759	19.8020	20.0750	20.1658	20.1823	20.1801	20.1065	19.6097	18.6512	17.8540	(93)

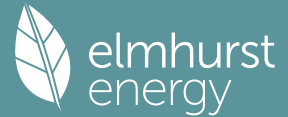
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9454	0.8951	0.7996	0.6333	0.4562	0.3065	0.2098	0.2507	0.4630	0.7593	0.9107	0.9543	(94)
Useful gains	906.3849	1133.2949	1314.6859	1345.8912	1130.8657	772.7646	502.8471	527.7558	804.9576	982.3551	907.0217	850.4802	(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	1976.8218	1963.5812	1828.5536	1555.9647	1192.9010	785.3483	505.4653	532.4389	850.6137	1283.3091	1651.9935	1961.0093	(97)
Space heating kWh	796.4051	557.9524	382.3175	151.2530	46.1543	0.0000	0.0000	0.0000	0.0000	223.9098	536.3797	826.2336	(98a)
Space heating requirement - total per year (kWh/year)												3520.6053	
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	796.4051	557.9524	382.3175	151.2530	46.1543	0.0000	0.0000	0.0000	0.0000	223.9098	536.3797	826.2336	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3520.6053	
Space heating per m2										(98c) / (4) =		29.7726	(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	796.4051	557.9524	382.3175	151.2530	46.1543	0.0000	0.0000	0.0000	0.0000	223.9098	536.3797	826.2336	(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)	862.8441	604.4988	414.2119	163.8710	50.0046	0.0000	0.0000	0.0000	0.0000	242.5891	581.1264	895.1610	(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)

Full SAP Calculation Printout



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	258.6726	228.8297	243.5154	215.3618	209.5559	189.7089	187.9869	195.0355	196.6892	218.2413	230.6874	256.0379 (64)
Efficiency of water heater												79.8000 (216)
(217)m	86.4107	85.9797	85.0669	83.2824	81.2870	79.8000	79.8000	79.8000	79.8000	84.1174	85.8869	86.4923 (217)
Fuel for water heating, kWh/month	299.3526	266.1439	286.2633	258.5923	257.7975	237.7305	235.5725	244.4055	246.4777	259.4487	268.5944	296.0240 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	29.6501	23.7864	21.4170	15.6910	12.1202	9.9023	11.0564	14.3716	18.6673	24.4925	27.6642	30.4741 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-45.5358	-64.3516	-92.7060	-104.4453	-112.7506	-105.2179	-103.8413	-97.9223	-87.5711	-73.5946	-50.0857	-39.3439 (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	-25.2728	-53.2137	-105.8790	-159.2149	-210.7461	-211.8947	-209.4777	-177.3323	-129.8837	-76.2574	-33.7878	-19.9880 (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												3814.3070 (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												3156.4027 (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)												239.2931 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2390.3142 (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												4905.6886 (238)

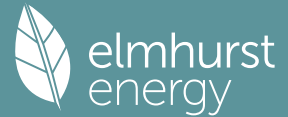
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3814.3070	0.2100	801.0045	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3156.4027	0.2100	662.8446	(264)
Space and water heating			1463.8490	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	239.2931	0.1443	34.5374	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-977.3661	0.1346	-131.5097	
PV Unit electricity exported	-1412.9481	0.1259	-177.8222	
Total			-309.3319	(269)
Total CO2, kg/year			1200.9837	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3814.3070	1.1300	4310.1669	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3156.4027	1.1300	3566.7351	(278)
Space and water heating			7876.9020	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	239.2931	1.5338	367.0357	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-977.3661	1.4973	-1463.4023	
PV Unit electricity exported	-1412.9481	0.4620	-652.7259	
Total			-2116.1282	(283)
Total Primary energy kWh/year			6257.9104	(286)
Target Primary Energy Rate (TPER)			52.9200	(287)

Full SAP Calculation Printout



Property Reference	Plot 9,10				Issued on Date	07/11/2025
Assessment Reference	00001		Prop Type Ref			
Property						
SAP Rating	80 C	DER	4.27	TER	11.11	
Environmental	96 A	% DER < TER				61.57
CO ₂ Emissions (t/year)	0.47	DFEE	41.01	TFEE	43.31	
Compliance Check	See BREL	% DFEE < TFEE				5.30
% DPER < TPER	22.01	DPER	45.30	TPER	58.08	
Assessor Details	Ms. Vanessa Vienna				Assessor ID	T798-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	48.3600 (1b)	x 2.5000 (2b)	= 120.9000 (1b) - (3b)
First floor	48.3900 (1c)	x 2.6100 (2c)	= 126.2979 (1c) - (3c)
Second floor	21.5000 (1d)	x 2.5900 (2d)	= 55.6850 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.2500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 302.8829 (5)

2. Ventilation rate

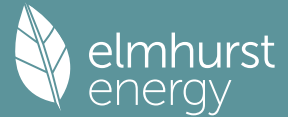
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												83.7000 (23c)
Effective ac	0.2584	0.2549	0.2515	0.2341	0.2307	0.2133	0.2133	0.2098	0.2202	0.2307	0.2376	0.2445 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			8.1500	1.1450	9.3321		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			37.0400	1.1450	42.4122		(27a)
Heatloss Floor 1			48.3600	0.1000	4.8360	110.0000	5319.6000 (28a)
External Wall 1	112.7000	10.0400	102.6600	0.1300	13.3458	190.0000	19505.3994 (29a)
pitched roof	45.3900	36.2400	9.1500	0.1000	0.9150	9.0000	82.3500 (30)
Roof 2	17.2000	0.8000	16.4000	0.1000	1.6400	9.0000	147.6000 (30)
Total net area of external elements Aum(A, m ²)			223.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.7491		(33)
Main dwelling							
Party Wall 1			58.1000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall 1			34.8700			9.0000	313.8300 (32c)
Internal Floor 1			48.3600			18.0000	870.4800 (32d)

Full SAP Calculation Printout



Internal Floor 2	21.5200	18.0000	387.3600 (32d)
Internal Ceiling 1	48.3000	9.0000	434.7000 (32e)
Internal Ceiling 2	21.0700	9.0000	189.6300 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 27250.9494 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 230.4520 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	19.7000	0.1600	3.1520
E5 Ground floor (normal)	19.7000	0.0700	1.3790
E6 Intermediate floor within a dwelling	24.8300	0.1200	2.9796
R8 Roof to wall (rafter)	10.3000	0.1200	1.2360
R4 Ridge (vaulted ceiling)	10.6500	0.1500	1.5975
E24 Eaves (insulation at ceiling level - inverted)	8.7000	0.4800	4.1760
P5 Party wall - Roof (insulation at rafter level)	18.6000	0.3200	5.9520
P1 Party wall - Ground floor	11.3000	0.0600	0.6780
E18 Party wall between dwellings	3.3800	0.4800	1.6224
P4 Party wall - Roof (insulation at ceiling level)	17.7300	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	11.3000	0.0900	1.0170
E16 Corner (normal)	3.1000	0.2500	0.7750
E12 Gable (insulation at ceiling level)	2.7900	0.0400	0.1116
E13 Gable (insulation at rafter level)	5.1000	0.2000	1.0200
E2 Other lintels (including other steel lintels)	4.2000	0.0400	0.1680
E3 Sill	15.9000	0.0500	0.7950
E4 Jamb			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.6591 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 101.4082 (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	25.8281	25.4813	25.1346	23.4011	23.0544	21.3209	21.3209	20.9742	22.0143	23.0544	23.7478	24.4412	(38)
Heat transfer coeff	127.2362	126.8895	126.5428	124.8093	124.4626	122.7290	122.7290	122.3823	123.4225	124.4626	125.1560	125.8494	(39)
Average = Sum(39)m / 12 =												124.7226	
HLP	1.0760	1.0731	1.0701	1.0555	1.0525	1.0379	1.0379	1.0349	1.0437	1.0525	1.0584	1.0643	(40)
HLP (average)												1.0547	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

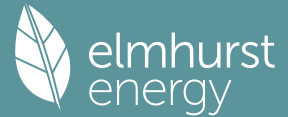
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8563 (42)
Hot water usage for mixer showers	72.1104	71.0268	69.4476	66.4262	64.1965	61.7100	60.2966	61.8638	63.5817	66.2515	69.3378	71.8342	(42a)
Hot water usage for baths	31.1331	30.6707	30.0196	28.8191	27.9201	26.9233	26.3849	27.0315	27.7354	28.8020	30.0273	31.0278	(42b)
Hot water usage for other uses	43.8813	42.2856	40.6899	39.0942	37.4986	35.9029	35.9029	37.4986	39.0942	40.6899	42.2856	43.8813	(42c)
Average daily hot water use (litres/day)												135.2407	(43)
Daily hot water use	147.1248	143.9831	140.1571	134.3395	129.6152	124.5362	122.5844	126.3938	130.4114	135.7435	141.6507	146.7433	(44)
Energy conte	233.0097	205.0300	215.4163	183.9041	174.4870	153.1317	148.2552	156.5019	160.8103	184.2026	201.8074	229.7645	(45)
Energy content (annual)										Total = Sum(45)m =		2246.3207	
Distribution loss (46)m = 0.15 x (45)m	34.9515	30.7545	32.3124	27.5856	26.1730	22.9698	22.2383	23.4753	24.1215	27.6304	30.2711	34.4647	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.2480	(55)
Total storage loss	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(56)
If cylinder contains dedicated solar storage	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(57)
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(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	302.8589	268.1196	285.2655	251.5001	244.3362	213.0837	210.2056	218.4523	220.7623	254.0518	269.4034	299.6137	(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	302.8589	268.1196	285.2655	251.5001	244.3362	213.0837	210.2056	218.4523	220.7623	254.0518	269.4034	299.6137	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3037.6531	(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	133.3551	118.6441	127.5053	115.2249	113.8963	98.8779	98.8552	101.5972	101.4310	117.1267	121.1778	132.2761	(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	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.6992	157.9884	142.6992	147.4558	142.6992	147.4558	142.6992	142.6992	147.4558	142.6992	147.4558	142.6992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.9171	285.8529	278.4548	262.7051	242.8240	224.1385	211.6554	208.7196	216.1177	231.8674	251.7486	270.4341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	(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)	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	(71)
Water heating gains (Table 5)	179.2407	176.5538	171.3781	160.0346	153.0864	137.3304	132.8699	136.5554	140.8764	157.4284	168.3025	177.7904	(72)
Total internal gains	670.7014	686.2395	658.3765	636.0400	604.4539	574.7691	553.0689	553.8186	570.2944	597.8394	633.3513	656.7681	(73)

Full SAP Calculation Printout



6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access factor		Gains W	
						Specific data or Table 6b		Specific data or Table 6c		Table 6d			
North				1.0000	10.6334	0.5500		0.7000		0.7700		2.8370 (74)	
South				7.1500	46.7521	0.5500		0.7000		0.7700		89.1868 (78)	
North				36.2400	26.0000	0.5500		0.7000		1.0000		326.4862 (82)	
South				0.8000	26.0000	0.5500		0.7000		1.0000		7.2072 (82)	
Solar gains	425.7172	844.5422	1427.3724	2150.2415	2703.2661	2799.0996	2651.6677	2230.9044	1681.3909	1011.0665	532.7506	348.9523	(83)
Total gains	1096.4187	1530.7817	2085.7489	2786.2815	3307.7201	3373.8687	3204.7365	2784.7230	2251.6853	1608.9059	1166.1018	1005.7204	(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	59.4933	59.6559	59.8193	60.6502	60.8191	61.6782	61.6782	61.8529	61.3317	60.8191	60.4822	60.1489	
alpha	4.9662	4.9771	4.9880	5.0433	5.0546	5.1119	5.1119	5.1235	5.0888	5.0546	5.0321	5.0099	
util living area	0.9815	0.9275	0.7755	0.5304	0.3488	0.2327	0.1685	0.2021	0.3765	0.7330	0.9516	0.9872	(86)
Living	20.1666	20.4793	20.7779	20.9147	20.9359	20.9391	20.9393	20.9394	20.9363	20.8537	20.4736	20.1117	
Non living	19.0635	19.4485	19.7897	19.9385	19.9592	19.9740	19.9741	19.9767	19.9673	19.8891	19.4585	19.0023	
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	20.5737	20.4793	20.7779	20.9147	20.9359	20.9391	20.9393	20.9394	20.9363	20.8537	20.4736	20.2360	(87)
Th 2	20.0205	20.0229	20.0253	20.0374	20.0398	20.0519	20.0519	20.0543	20.0470	20.0398	20.0349	20.0301	(88)
util rest of house	0.9765	0.9114	0.7415	0.4913	0.3132	0.1983	0.1322	0.1606	0.3252	0.6830	0.9377	0.9836	(89)
MIT 2	19.6390	19.4485	19.7897	19.9385	19.9592	19.9740	19.9741	19.9767	19.9673	19.8891	19.4585	19.1875	(90)
Living area fraction	19.8663	19.6992	20.0301	20.1759	20.1968	20.2087	20.2089	20.2108	20.2030	20.1237	19.7054	19.4425	(92)
MIT	19.8663	19.6992	20.0301	20.1759	20.1968	20.2087	20.2089	20.2108	20.2030	20.1237	19.7054	19.4425	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8663	19.6992	20.0301	20.1759	20.1968	20.2087	20.2089	20.2108	20.2030	20.1237	19.7054	19.4425	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9756	0.9052	0.7416	0.4970	0.3190	0.2040	0.1382	0.1675	0.3337	0.6876	0.9320	0.9809	(94)
Useful gains	1069.6739	1385.6871	1546.8696	1384.7432	1055.2684	688.1903	442.8966	466.3377	751.3414	1106.2990	1086.8423	986.4921	(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	1980.5962	1877.8652	1712.1331	1407.3368	1057.5289	688.3524	442.9120	466.3787	753.2493	1185.3412	1577.6436	1918.2616	(97)
Space heating kWh	677.7262	330.7437	122.9561	16.2674	1.6818	0.0000	0.0000	0.0000	0.0000	58.8074	353.3769	693.2365	(98a)
Space heating requirement - total per year (kWh/year)												2254.7959	
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	677.7262	330.7437	122.9561	16.2674	1.6818	0.0000	0.0000	0.0000	0.0000	58.8074	353.3769	693.2365	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2254.7959	
Space heating per m2										(98c) / (4) =		19.0680	(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 %)												365.3635	(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	677.7262	330.7437	122.9561	16.2674	1.6818	0.0000	0.0000	0.0000	0.0000	58.8074	353.3769	693.2365	(98)
Space heating efficiency (main heating system 1)	365.3635	365.3635	365.3635	365.3635	365.3635	0.0000	0.0000	0.0000	0.0000	365.3635	365.3635	365.3635	(210)
Space heating fuel (main heating system)	185.4937	90.5246	33.6531	4.4524	0.4603	0.0000	0.0000	0.0000	0.0000	16.0956	96.7193	189.7389	(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	302.8589	268.1196	285.2655	251.5001	244.3362	213.0837	210.2056	218.4523	220.7623	254.0518	269.4034	299.6137	(64)
Efficiency of water heater	177.2911	177.2911	177.2911	177.2911	177.2911	177.2911	177.2911	177.2911	177.2911	177.2911	177.2911	177.2911	(216)
Fuel for water heating, kWh/month	170.8258	151.2312	160.9023	141.8571	137.8163	120.1886	118.5652	123.2167	124.5197	143.2964	151.9554	168.9953	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	28.5591	25.7953	28.5591	27.6379	28.5591	27.6379	28.5591	28.5591	27.6379	28.5591	27.6379	28.5591	(231)
Lighting	101.7680	81.6420	73.5096	53.8563	41.6001	33.9877	37.9490	49.3276	64.0717	84.0655	94.9518	104.5964	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	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)	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)													

Full SAP Calculation Printout



(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												617.1377	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.2911	
Water heating fuel used												1713.3700	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)													
mechanical ventilation fans (SFP = 0.9100)												336.2606	(230a)
Total electricity for the above, kWh/year												336.2606	(231)
Electricity for lighting (calculated in Appendix L)												821.3258	(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												3488.0941	(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	617.1377	0.1593	98.2868	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1713.3700	0.1411	241.6918	(264)
Space and water heating			339.9786	(265)
Pumps, fans and electric keep-hot	336.2606	0.1387	46.6435	(267)
Energy for lighting	821.3258	0.1443	118.5427	(268)
Total CO2, kg/year			505.1648	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2700	(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	617.1377	1.5894	980.8686	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1713.3700	1.5216	2607.0790	(278)
Space and water heating			3587.9476	(279)
Pumps, fans and electric keep-hot	336.2606	1.5128	508.6950	(281)
Energy for lighting	821.3258	1.5338	1259.7769	(282)
Total Primary energy kWh/year			5356.4195	(286)
Dwelling Primary energy Rate (DPER)			45.3000	(287)

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

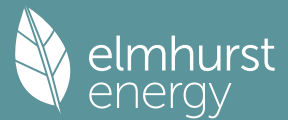
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	48.3600 (1b)	x 2.5000 (2b)	= 120.9000 (1b) - (3b)	
First floor	48.3900 (1c)	x 2.6100 (2c)	= 126.2979 (1c) - (3c)	
Second floor	21.5000 (1d)	x 2.5900 (2d)	= 55.6850 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.2500			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 302.8829	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1321 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Full SAP Calculation Printout



Measured/design AP50 5.0000 (17)
Infiltration rate 0.3821 (18)
Number of sides sheltered 1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3534 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
Effective ac	0.4506	0.4418	0.4329	0.3888	0.3799	0.3357	0.3357	0.3269	0.3534	0.3799	0.3976	0.4153
	0.6015	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5534	0.5624	0.5722	0.5790	0.5862

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			4.9900	1.1450	5.7137		(27)
TER Roof Light			22.6700	1.5918	45.8401		(27a)
Heatloss Floor 1			48.3600	0.1300	6.2868		(28a)
External Wall 1	112.7000	6.8800	105.8200	0.1800	19.0476		(29a)
pitched roof	45.3900	22.1900	23.2000	0.1100	2.5520		(30)
Roof 2	17.2000	0.4800	16.7200	0.1100	1.8392		(30)
Total net area of external elements Aum(A, m2)			223.6500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	83.1694	(33)
Main dwelling							
Party Wall 1			58.1000	0.0000	0.0000		(32)

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

230.4520 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	19.7000	0.1600	3.1520
E6 Intermediate floor within a dwelling	19.7000	0.0000	0.0000
R8 Roof to wall (rafter)	24.8300	0.0600	1.4898
R4 Ridge (vaulted ceiling)	10.3000	0.0800	0.8240
E24 Eaves (insulation at ceiling level - inverted)	10.6500	0.2400	2.5560
P5 Party wall - Roof (insulation at rafter level)	8.7000	0.0800	0.6960
P1 Party wall - Ground floor	18.6000	0.0800	1.4880
E18 Party wall between dwellings	11.3000	0.0600	0.6780
P4 Party wall - Roof (insulation at ceiling level)	3.3800	0.1200	0.4056
P2 Party wall - Intermediate floor within a dwelling	17.7300	0.0000	0.0000
E16 Corner (normal)	11.3000	0.0900	1.0170
E12 Gable (insulation at ceiling level)	3.1000	0.0600	0.1860
E13 Gable (insulation at rafter level)	2.7900	0.0800	0.2232
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	4.2000	0.0500	0.2100
E4 Jamb	15.9000	0.0500	0.7950

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

13.9756 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 97.1450 (37)

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

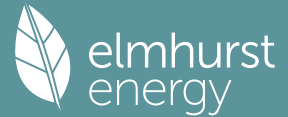
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	60.1226	59.7286	59.3424	57.5283	57.1889	55.6090	55.6090	55.3164	56.2176	57.1889	57.8755	58.5934
Average = Sum(39)m / 12 =	157.2676	156.8736	156.4874	154.6734	154.3340	152.7540	152.7540	152.4614	153.3626	154.3340	155.0206	155.7384
												154.6717

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3300	1.3266	1.3234	1.3080	1.3051	1.2918	1.2918	1.2893	1.2969	1.3051	1.3110	1.3170
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8563 (42)
Hot water usage for mixer showers													
Hot water usage for baths	72.1104	71.0268	69.4476	66.4262	64.1965	61.7100	60.2966	61.8638	63.5817	66.2515	69.3378	71.8342	(42a)
Hot water usage for other uses	31.1331	30.6707	30.0196	28.8191	27.9201	26.9233	26.3849	27.0315	27.7354	28.8020	30.0273	31.0278	(42b)
Average daily hot water use (litres/day)	43.8813	42.2856	40.6899	39.0942	37.4986	35.9029	35.9029	37.4986	39.0942	40.6899	42.2856	43.8813	(42c)
													135.2407 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	147.1248	143.9831	140.1571	134.3395	129.6152	124.5362	122.5844	126.3938	130.4114	135.7435	141.6507	146.7433	(44)
Energy content (annual)	233.0097	205.0300	215.4163	183.9041	174.4870	153.1317	148.2552	156.5019	160.8103	184.2026	201.8074	229.7645	(45)
Distribution loss (46)m = 0.15 x (45)m	34.9515	30.7545	32.3124	27.5856	26.1730	22.9698	22.2383	23.4753	24.1215	27.6304	30.2711	34.4647	(46)
Water storage loss:													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.1127 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1409 (55)
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage													
Primary loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	291.6385	257.9850	274.0451	240.6417	233.1158	209.8693	206.8840	215.1308	217.5479	242.8314	258.5450	288.3933	(62)
PV diverter	-32.9659	-29.1553	-30.5297	-25.2798	-23.5599	-20.1604	-18.8971	-20.0952	-20.8587	-24.5901	-27.8576	-32.3554	(63a)
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	(63b)
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	(63c)
Output from w/h	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)
Total per year (kWh/year) = Sum(64)m =	258.6726	228.8297	243.5154	215.3618	209.5559	189.7089	187.9869	195.0355	196.6892	218.2413	230.6874	256.0379	(64)
													2630.3225 (64)

Full SAP Calculation Printout



12Total per year (kWh/year)												2630 (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												
124.3788	110.5365	118.5290	106.5382	104.9200	96.3064	96.1979	98.9399	98.8595	108.1504	112.4910	123.2997	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146	142.8146 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
142.6992	157.9884	142.6992	147.4558	142.6992	147.4558	142.6992	147.4558	142.6992	147.4558	142.6992	147.4558	142.6992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
282.9171	285.8529	278.4548	262.7051	242.8240	224.1385	211.6554	208.7196	216.1177	231.8674	251.7486	270.4341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	37.2815	(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)												
-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	-114.2517	(71)
Water heating gains (Table 5)												
167.1758	164.4889	159.3131	147.9697	141.0215	133.7588	129.2983	132.9838	137.3048	145.3635	156.2375	165.7255	(72)
Total internal gains	661.6365	677.1746	649.3115	626.9750	595.3890	571.1975	549.4973	550.2470	566.7228	588.7745	624.2863	647.7031 (73)

6. Solar gains

[Jan]														
	Area				Solar flux		g		FF		Access		Gains	
	m2				Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
North	0.6100				10.6334		0.6300		0.7000		0.7700		1.9823 (74)	
South	4.3800				46.7521		0.6300		0.7000		0.7700		62.5816 (78)	
North	22.1900				26.0000		0.6300		0.7000		1.0000		228.9875 (82)	
South	0.4800				26.0000		0.6300		0.7000		1.0000		4.9533 (82)	
Solar gains	298.5047	592.1579	1000.7760	1507.5565	1895.2563	1962.4334	1859.0743	1564.0977	1178.8604	708.9070	373.5509	244.6810	(83)	
Total gains	960.1412	1269.3325	1650.0875	2134.5315	2490.6453	2533.6309	2408.5715	2114.3447	1745.5832	1297.6815	997.8372	892.3841	(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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
48.1327	48.2535	48.3726	48.9400	49.0476	49.5549	49.5549	49.6500	49.3583	49.0476	48.8303	48.6053	48.6053
alpha	4.2088	4.2169	4.2248	4.2627	4.2698	4.3037	4.3037	4.3100	4.2906	4.2698	4.2554	4.2404
util living area	0.9908	0.9719	0.9124	0.7533	0.5517	0.3819	0.2782	0.3298	0.5762	0.8853	0.9794	0.9931 (86)
MIT	19.4361	19.7930	20.2863	20.7529	20.9426	20.9906	20.9981	20.9962	20.9508	20.5721	19.8967	19.3807 (87)
Th 2	19.8174	19.8200	19.8226	19.8346	19.8368	19.8473	19.8473	19.8492	19.8432	19.8368	19.8323	19.8275 (88)
util rest of house	0.9879	0.9638	0.8899	0.7060	0.4904	0.3148	0.2058	0.2483	0.4909	0.8463	0.9721	0.9910 (89)
MIT 2	18.0302	18.4809	19.0832	19.6127	19.7954	19.8426	19.8467	19.8480	19.8145	19.4428	18.6254	17.9667 (90)
Living area fraction	18.3721	18.8000	19.3758	19.8900	20.0744	20.1218	20.1268	20.1273	20.0909	19.7174	18.9346	18.3106 (91)
MIT	18.3721	18.8000	19.3758	19.8900	20.0744	20.1218	20.1268	20.1273	20.0909	19.7174	18.9346	18.3106 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3721	18.8000	19.3758	19.8900	20.0744	20.1218	20.1268	20.1273	20.0909	19.7174	18.9346	18.3106 (93)

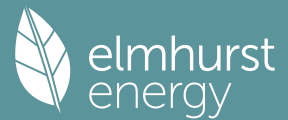
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9829	0.9546	0.8798	0.7084	0.5033	0.3310	0.2234	0.2681	0.5099	0.8415	0.9644	0.9869 (94)
Useful gains	943.7535	1211.7463	1451.7638	1512.0622	1253.4583	838.5125	538.0641	566.8218	890.0960	1092.0338	962.2972	880.6748 (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	2213.0886	2180.5399	2014.9055	1699.8659	1292.4603	843.4761	538.7287	568.2660	918.7756	1407.1283	1834.6052	2197.5590 (97)
Space heating kWh	944.3853	651.0293	418.9774	135.2186	29.0174	0.0000	0.0000	0.0000	0.0000	234.4303	628.0618	979.7619 (98a)
Space heating requirement - total per year (kWh/year)												4020.8820
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	944.3853	651.0293	418.9774	135.2186	29.0174	0.0000	0.0000	0.0000	0.0000	234.4303	628.0618	979.7619 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4020.8820
Space heating per m2												(98c) / (4) = 34.0032 (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	944.3853	651.0293	418.9774	135.2186	29.0174	0.0000	0.0000	0.0000	0.0000	234.4303	628.0618	979.7619 (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)	1023.1694	705.3405	453.9300	146.4991	31.4382	0.0000	0.0000	0.0000	0.0000	253.9873	680.4569	1061.4972 (211)

Full SAP Calculation Printout



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	258.6726	228.8297	243.5154	215.3618	209.5559	189.7089	187.9869	195.0355	196.6892	218.2413	230.6874	256.0379	(64)
Efficiency of water heater	86.6976	86.2696	85.2653	83.0464	80.7960	79.8000	79.8000	79.8000	79.8000	84.2206	86.1888	79.8000	(216)
Fuel for water heating, kWh/month	298.3619	265.2497	285.5974	259.3272	259.3642	237.7305	235.5725	244.4055	246.4777	259.1307	267.6537	295.0683	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	29.6501	23.7864	21.4170	15.6910	12.1202	9.9023	11.0564	14.3716	18.6673	24.4925	27.6642	30.4741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.5358	-64.3516	-92.7060	-104.4453	-112.7506	-105.2179	-103.8413	-97.9223	-87.5711	-73.5946	-50.0857	-39.3439	(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	-25.2728	-53.2137	-105.8790	-159.2149	-210.7461	-211.8947	-209.4777	-177.3323	-129.8837	-76.2574	-33.7878	-19.9880	(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												4356.3186	(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												3153.9390	(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)												239.2931	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2390.3142	(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												5445.2365	(238)

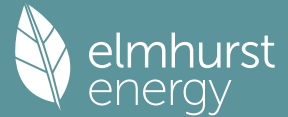
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4356.3186	0.2100	914.8269 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3153.9390	0.2100	662.3272 (264)
Space and water heating			1577.1541 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	239.2931	0.1443	34.5374 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.3661	0.1346	-131.5097
PV Unit electricity exported	-1412.9481	0.1259	-177.8222
Total			-309.3319 (269)
Total CO2, kg/year			1314.2888 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4356.3186	1.1300	4922.6400 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3153.9390	1.1300	3563.9511 (278)
Space and water heating			8486.5911 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	239.2931	1.5338	367.0357 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.3661	1.4973	-1463.4023
PV Unit electricity exported	-1412.9481	0.4620	-652.7259
Total			-2116.1282 (283)
Total Primary energy kWh/year			6867.5995 (286)
Target Primary Energy Rate (TPER)			58.0800 (287)

Full SAP Calculation Printout



Property Reference	Plot 17	Issued on Date	07/11/2025
Assessment Reference	00001	Prop Type Ref	
Property			
SAP Rating	79 C	DER	4.51
Environmental	96 A	% DER < TER	64.66
CO ₂ Emissions (t/year)	0.52	DFEE	46.61
Compliance Check	See BREL	% DFEE < TFEE	10.57
% DPER < TPER	28.93	DPER	47.76
		TPER	67.20
Assessor Details	Ms. Vanessa Vienna	Assessor ID	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	66.9200 (1b)	x 2.5000 (2b)	= 167.3000 (1b) - (3b)
First floor	59.0000 (1c)	x 3.7900 (2c)	= 223.6100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 390.9100 (5)

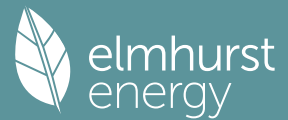
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.1912 0.1875 0.1837 0.1650 0.1612 0.1425 0.1425 0.1388 0.1500 0.1612 0.1687 0.1762 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)
Effective ac	0.2727 0.2690 0.2652 0.2465 0.2427 0.2240 0.2240 0.2202 0.2315 0.2427 0.2502 0.2577 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			13.5600	1.1450	15.5267		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			3.6000	1.1450	4.1221		(27a)
Heatloss Floor 1			66.9000	0.1000	6.6900	110.0000	7359.0000 (28a)
External Wall 1	187.4000	15.4500	171.9500	0.1300	22.3535	190.0000	32670.4988 (29a)
pitched roof	105.7300	3.6000	102.1300	0.1000	10.2130	9.0000	919.1700 (30)
Total net area of external elements Aum(A, m ²)			360.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.1734		(33)
Main dwelling							
Party Floor 1			130.7600			80.0000	10460.8000 (32d)
Internal Wall 1			43.9700			9.0000	395.7300 (32c)
Internal Floor 1			59.0000			18.0000	1062.0000 (32d)
Internal Ceiling 1			59.0000			9.0000	531.0000 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 53398.1989 (34)
424.0645 (35)

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	21.2000	0.0900	1.9080
E5 Ground floor (normal)	38.1300	0.1600	6.1008
E6 Intermediate floor within a dwelling	29.8000	0.0700	2.0860
E13 Gable (insulation at rafter level)	27.0000	0.0400	1.0800
R8 Roof to wall (rafter)	27.4000	0.1200	3.2880
R4 Ridge (vaulted ceiling)	13.7000	0.1200	1.6440
E2 Other lintels (including other steel lintels)	10.3500	0.2000	2.0700
E3 Sill	9.4500	0.0400	0.3780
E4 Jamb	32.3000	0.0500	1.6150
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			20.1698 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	81.3432 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.1848	34.7011	34.2173	31.7986	31.3148	28.8961	28.8961	28.4123	29.8636	31.3148	32.2823	33.2498	(38)
Heat transfer coeff	116.5280	116.0442	115.5605	113.1417	112.6580	110.2392	110.2392	109.7555	111.2067	112.6580	113.6255	114.5930	(39)
Average = Sum(39)m / 12 =												113.0208	
HLP	0.9254	0.9216	0.9177	0.8985	0.8947	0.8755	0.8755	0.8716	0.8832	0.8947	0.9024	0.9100	(40)
HLP (average)												0.8976	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8836 (42)
Hot water usage for mixer showers	72.5678	71.4772	69.8881	66.8475	64.6037	62.1014	60.6791	62.2562	63.9850	66.6717	69.7776	72.2898	(42a)
Hot water usage for baths	31.3297	30.8645	30.2092	29.0011	28.0965	27.0934	26.5516	27.2022	27.9107	28.9840	30.2170	31.2238	(42b)
Hot water usage for other uses	44.1606	42.5548	40.9489	39.3431	37.7373	36.1314	36.1314	37.7373	39.3431	40.9489	42.5548	44.1606	(42c)
Average daily hot water use (litres/day)												136.0987	(43)
Daily hot water use	148.0582	144.8965	141.0463	135.1918	130.4374	125.3262	123.3621	127.1957	131.2387	136.6047	142.5494	147.6742	(44)
Energy conte	234.4879	206.3307	216.7829	185.0708	175.5939	154.1032	149.1957	157.4948	161.8305	185.3712	203.0877	231.2221	(45)
Energy content (annual)										Total = Sum(45)m =		2260.5713	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	35.1732	30.9496	32.5174	27.7606	26.3391	23.1155	22.3794	23.6242	24.2746	27.8057	30.4632	34.6833	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.2480	(55)
Total storage loss	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(56)
If cylinder contains dedicated solar storage													
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(57)
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													
WWHRS	304.3371	269.4203	286.6321	252.6668	245.4431	214.0552	211.1461	219.4452	221.7825	255.2204	270.6837	301.0713	(62)
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	(63a)
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	(63b)
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	(63c)
Output from w/h	304.3371	269.4203	286.6321	252.6668	245.4431	214.0552	211.1461	219.4452	221.7825	255.2204	270.6837	301.0713	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3051.9037	(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	133.8466	119.0766	127.9597	115.6128	114.2643	99.2009	99.1679	101.9273	101.7702	117.5153	121.6035	132.7607	(65)

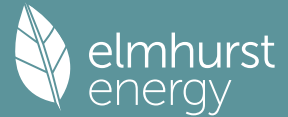
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.8827	174.7988	157.8827	163.1455	157.8827	163.1455	157.8827	157.8827	163.1455	157.8827	163.1455	157.8827	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	292.7327	295.7704	288.1156	271.8195	251.2485	231.9148	218.9986	215.9610	223.6158	239.9119	260.4828	279.8166	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	(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)	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	(71)
Water heating gains (Table 5)	179.9013	177.1974	171.9888	160.5734	153.5811	137.7790	133.2902	136.9991	141.3476	157.9507	168.8937	178.4418	(72)
Total internal gains	696.7703	714.0200	684.2406	661.7919	628.9659	599.0928	576.4251	577.0964	594.3623	621.9988	658.7755	682.3947	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.6800	10.6334	0.5500	0.7000	0.7700	1.9292 (74)
East	3.5000	19.6403	0.5500	0.7000	0.7700	18.3404 (76)

Full SAP Calculation Printout



South			5.7800		46.7521		0.5500		0.7000		0.7700		72.0979 (78)
West			3.6000		19.6403		0.5500		0.7000		0.7700		18.8644 (80)
North			1.8000		26.0000		0.5500		0.7000		1.0000		16.2162 (82)
South			1.8000		26.0000		0.5500		0.7000		1.0000		16.2162 (82)

Solar gains	143.6643	261.9047	396.2845	541.9765	644.4360	653.7768	624.6638	547.6979	447.5057	300.4353	175.3948	120.6984 (83)
Total gains	840.4347	975.9247	1080.5252	1203.7683	1273.4019	1252.8696	1201.0889	1124.7943	1041.8680	922.4341	834.1703	803.0930 (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	127.2899	127.8205	128.3556	131.0996	131.6625	134.5513	134.5513	135.1444	133.3807	131.6625	130.5414	129.4393	
alpha	9.4860	9.5214	9.5570	9.7400	9.7775	9.9701	9.9701	10.0096	9.8920	9.7775	9.7028	9.6293	
util living area	0.9998	0.9990	0.9946	0.9540	0.7981	0.5623	0.4038	0.4488	0.7267	0.9778	0.9990	0.9999 (86)	
Living	20.4994	20.5892	20.7130	20.8743	20.9548	20.9683	20.9687	20.9688	20.9642	20.8536	20.6514	20.4921	
Non living	19.5576	19.6754	19.8355	20.0435	20.1230	20.1481	20.1483	20.1517	20.1396	20.0268	19.7695	19.5596	
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	20.7439	20.5892	20.7130	20.8743	20.9548	20.9683	20.9687	20.9688	20.9642	20.8536	20.6514	20.5631 (87)	
Th 2	20.1460	20.1492	20.1525	20.1688	20.1720	20.1884	20.1884	20.1917	20.1818	20.1720	20.1655	20.1590 (88)	
util rest of house	0.9997	0.9984	0.9914	0.9307	0.7378	0.4915	0.3293	0.3700	0.6460	0.9614	0.9984	0.9998 (89)	
MIT 2	19.9114	19.6754	19.8355	20.0435	20.1230	20.1481	20.1483	20.1517	20.1396	20.0268	19.7695	19.6676 (90)	
Living area fraction									fLA =	Living area / (4) =		0.1711 (91)	
MIT	20.0539	19.8318	19.9856	20.1857	20.2653	20.2885	20.2887	20.2915	20.2807	20.1683	19.9205	19.8209 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.0539	19.8318	19.9856	20.1857	20.2653	20.2885	20.2887	20.2915	20.2807	20.1683	19.9205	19.8209 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9997	0.9981	0.9905	0.9313	0.7449	0.5003	0.3386	0.3797	0.6560	0.9613	0.9981	0.9998 (94)	
Useful gains	840.1592	974.1182	1070.3050	1121.0392	948.6090	626.7790	406.6316	427.1018	683.4734	886.7717	832.5711	802.8961 (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	1835.7677	1732.7495	1558.4065	1276.8827	964.9529	627.0947	406.6371	427.1181	687.3351	1077.9439	1456.7309	1790.0425 (97)	
Space heating kWh	740.7327	509.8002	363.1474	112.2073	12.1599	0.0000	0.0000	0.0000	0.0000	142.2321	449.3950	734.4370 (98a)	
Space heating requirement - total per year (kWh/year)												3064.1117	
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	740.7327	509.8002	363.1474	112.2073	12.1599	0.0000	0.0000	0.0000	0.0000	142.2321	449.3950	734.4370 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3064.1117	
Space heating per m2										(98c) / (4) =		24.3338 (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 %)													361.3085 (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	740.7327	509.8002	363.1474	112.2073	12.1599	0.0000	0.0000	0.0000	0.0000	142.2321	449.3950	734.4370 (98)	
Space heating efficiency (main heating system 1)	361.3085	361.3085	361.3085	361.3085	361.3085	0.0000	0.0000	0.0000	0.0000	361.3085	361.3085	361.3085 (210)	
Space heating fuel (main heating system)	205.0140	141.0983	100.5090	31.0558	3.3655	0.0000	0.0000	0.0000	0.0000	39.3658	124.3799	203.2715 (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	304.3371	269.4203	286.6321	252.6668	245.4431	214.0552	211.1461	219.4452	221.7825	255.2204	270.6837	301.0713 (64)	
Efficiency of water heater	177.1970	177.1970	177.1970	177.1970	177.1970	177.1970	177.1970	177.1970	177.1970	177.1970	177.1970	177.1970 (216)	
Fuel for water heating, kWh/month	171.7507	152.0456	161.7590	142.5909	138.5142	120.8007	119.1590	123.8425	125.1615	144.0320	152.7586	169.9077 (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	36.8593	33.2923	36.8593	35.6703	36.8593	35.6703	36.8593	36.8593	35.6703	36.8593	35.6703	36.8593 (231)	
Lighting	112.5963	90.3289	81.3312	59.5867	46.0265	37.6040	41.9869	54.5762	70.8891	93.0103	105.0549	115.7257 (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)	

Full SAP Calculation Printout



Annual totals kWh/year	
Space heating fuel - main system 1	848.0598 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	177.1970
Water heating fuel used	1722.3225 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)	
mechanical ventilation fans (SFP = 0.9100)	433.9883 (230a)
Total electricity for the above, kWh/year	433.9883 (231)
Electricity for lighting (calculated in Appendix L)	908.7168 (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	3913.0873 (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	848.0598	0.1574	133.5245 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1722.3225	0.1411	242.9588 (264)
Space and water heating			376.4833 (265)
Pumps, fans and electric keep-hot	433.9883	0.1387	60.1995 (267)
Energy for lighting	908.7168	0.1443	131.1559 (268)
Total CO2, kg/year			567.8387 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5100 (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	848.0598	1.5829	1342.3575 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1722.3225	1.5216	2620.7167 (278)
Space and water heating			3963.0742 (279)
Pumps, fans and electric keep-hot	433.9883	1.5128	656.5375 (281)
Energy for lighting	908.7168	1.5338	1393.8201 (282)
Total Primary energy kWh/year			6013.4317 (286)
Dwelling Primary energy Rate (DPER)			47.7600 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

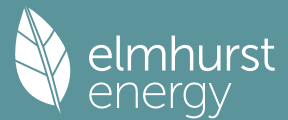
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	66.9200 (1b)	x 2.5000 (2b)	= 167.3000 (1b) - (3b)
First floor	59.0000 (1c)	x 3.7900 (2c)	= 223.6100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 390.9100 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1023 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3523 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3523 (21)

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

Full SAP Calculation Printout



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	0.4492	0.4404	0.4316	0.3876	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3964	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5786	0.5857 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			13.5600	1.1450	15.5267		(27)
TER Roof Light			3.6000	1.5918	7.2794		(27a)
Heatloss Floor 1			66.9000	0.1300	8.6970		(28a)
External Wall 1	187.4000	15.4500	171.9500	0.1800	30.9510		(29a)
pitched roof	105.7300	3.6000	102.1300	0.1100	11.2343		(30)
Total net area of external elements Aum(A, m2)			360.0300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 75.5784		(33)

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

424.0645 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	21.2000	0.0900	1.9080
E5 Ground floor (normal)	38.1300	0.1600	6.1008
E6 Intermediate floor within a dwelling	29.8000	0.0000	0.0000
E13 Gable (insulation at rafter level)	27.0000	0.0800	2.1600
R8 Roof to wall (rafter)	27.4000	0.0600	1.6440
R4 Ridge (vaulted ceiling)	13.7000	0.0800	1.0960
E2 Other lintels (including other steel lintels)	10.3500	0.0500	0.5175
E3 Sill	9.4500	0.0500	0.4725
E4 Jamb	32.3000	0.0500	1.6150

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

15.5138 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 91.0922 (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	77.5159	77.0105	76.5151	74.1881	73.7528	71.7261	71.7261	71.3508	72.5068	73.7528	74.6335	75.5543 (38)
Heat transfer coeff	168.6081	168.1027	167.6073	165.2804	164.8450	162.8183	162.8183	162.4430	163.5990	164.8450	165.7257	166.6465 (39)
Average = Sum(39)m / 12 =												165.2783

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3390	1.3350	1.3311	1.3126	1.3091	1.2930	1.2930	1.2900	1.2992	1.3091	1.3161	1.3234 (40)
HLP (average)												1.3126
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

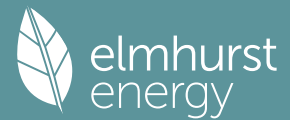
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8836 (42)
Hot water usage for mixer showers												
72.5678	71.4772	69.8881	66.8475	64.6037	62.1014	60.6791	62.2562	63.9850	66.6717	69.7776	72.2898	(42a)
Hot water usage for baths												
31.3297	30.8645	30.2092	29.0011	28.0965	27.0934	26.5516	27.2022	27.9107	28.9840	30.2170	31.2238	(42b)
Hot water usage for other uses												
44.1606	42.5548	40.9489	39.3431	37.7373	36.1314	36.1314	37.7373	39.3431	40.9489	42.5548	44.1606	(42c)
Average daily hot water use (litres/day)												136.0987 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	148.0582	144.8965	141.0463	135.1918	130.4374	125.3262	123.3621	127.1957	131.2387	136.6047	142.5494	147.6742 (44)
Energy conte	234.4879	206.3307	216.7829	185.0708	175.5939	154.1032	149.1957	157.4948	161.8305	185.3712	203.0877	231.2221 (45)
Energy content (annual)										Total = Sum(45)m =		2260.5713
Distribution loss (46)m = 0.15 x (45)m												
35.1732	30.9496	32.5174	27.7606	26.3391	23.1155	22.3794	23.6242	24.2746	27.8057	30.4632	34.6833	(46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1127 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1409 (55)
Total storage loss												
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage												
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
293.1168	259.2857	275.4117	241.8083	234.2227	210.8407	207.8245	216.1236	218.5681	244.0000	259.8253	289.8509	(62)
WWHRS	-33.1750	-29.3402	-30.7234	-25.4402	-23.7093	-20.2882	-19.0170	-20.2227	-20.9910	-24.7461	-28.0343	-32.5606 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
259.9418	229.9455	244.6883	216.3681	210.5133	190.5525	188.8075	195.9009	197.5771	219.2540	231.7910	257.2903	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2642.6304 (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												
124.8703	110.9690	118.9833	106.9261	105.2880	96.6294	96.5106	99.2701	99.1987	108.5390	112.9167	123.7844	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	144.1784	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
157.8827	174.7988	157.8827	163.1455	157.8827	163.1455	157.8827	157.8827	163.1455	157.8827	163.1455	157.8827	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
292.7327	295.7704	288.1156	271.8195	251.2485	231.9148	218.9986	215.9610	223.6158	239.9119	260.4828	279.8166	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

Full SAP Calculation Printout



Pumps, fans	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	37.4178	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	-115.3427	(71)
Water heating gains (Table 5)	167.8364	165.1324	159.9239	148.5084	141.5161	134.2074	129.7186	133.4275	137.7760	145.8857	156.8288	166.3769	(72)
Total internal gains	687.7054	704.9551	675.1757	652.7269	619.9010	595.5212	572.8535	573.5248	590.7907	612.9339	649.7106	673.3297	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				0.6800	10.6334		0.6300	0.7000		0.7700		2.2098 (74)	
East				3.5000	19.6403		0.6300	0.7000		0.7700		21.0081 (76)	
South				5.7800	46.7521		0.6300	0.7000		0.7700		82.5849 (78)	
West				3.6000	19.6403		0.6300	0.7000		0.7700		21.6084 (80)	
North				1.8000	26.0000		0.6300	0.7000		1.0000		18.5749 (82)	
South				1.8000	26.0000		0.6300	0.7000		1.0000		18.5749 (82)	
Solar gains	164.5610	300.0000	453.9259	620.8094	738.1722	748.8716	715.5240	627.3631	512.5974	344.1350	200.9067	138.2545	(83)
Total gains	852.2664	1004.9550	1129.1016	1273.5364	1358.0731	1344.3928	1288.3775	1200.8879	1103.3882	957.0689	850.6173	811.5842	(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	87.9722	88.2367	88.4975	89.7435	89.9805	91.1005	91.1005	91.3110	90.6658	89.9805	89.5023	89.0078		
alpha	6.8648	6.8824	6.8998	6.9829	6.9987	7.0734	7.0734	7.0874	7.0444	6.9987	6.9668	6.9339		
util living area	0.9998	0.9993	0.9973	0.9840	0.9213	0.7421	0.5521	0.6139	0.8854	0.9925	0.9994	0.9999	(86)	
MIT	19.9452	20.0852	20.2988	20.5977	20.8480	20.9761	20.9973	20.9946	20.9181	20.5879	20.2172	19.9301	(87)	
Th 2	19.8104	19.8135	19.8166	19.8310	19.8337	19.8463	19.8463	19.8486	19.8414	19.8337	19.8282	19.8225	(88)	
util rest of house	0.9997	0.9989	0.9955	0.9726	0.8693	0.6258	0.4098	0.4654	0.7952	0.9852	0.9989	0.9998	(89)	
MIT 2	18.5951	18.7770	19.0522	19.4383	19.7229	19.8373	19.8459	19.8477	19.7986	19.4331	18.9577	18.5851	(90)	
Living area fraction									FLA = Living area / (4) =			0.1711	(91)	
MIT	18.8262	19.0009	19.2655	19.6367	19.9154	20.0322	20.0429	20.0440	19.9902	19.6307	19.1732	18.8153	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.8262	19.0009	19.2655	19.6367	19.9154	20.0322	20.0429	20.0440	19.9902	19.6307	19.1732	18.8153	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9995	0.9984	0.9942	0.9700	0.8738	0.6458	0.4344	0.4913	0.8091	0.9833	0.9985	0.9997	(94)	
Useful gains	851.8703	1003.3767	1122.5803	1235.3814	1186.6175	868.2613	559.6944	589.9381	892.7829	941.0782	849.3533	811.3187	(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	2449.2275	2370.3916	2139.5986	1774.5698	1354.2745	884.4653	560.5750	591.9396	963.6269	1488.6684	2000.8443	2435.5883	(97)	
Space heating kWh	1188.4338	918.6340	756.6616	388.2157	124.7368	0.0000	0.0000	0.0000	0.0000	407.4071	829.0735	1208.4566	(98a)	
Space heating requirement - total per year (kWh/year)												5821.6190		
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	1188.4338	918.6340	756.6616	388.2157	124.7368	0.0000	0.0000	0.0000	0.0000	407.4071	829.0735	1208.4566	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												5821.6190		
Space heating per m ²												(98c) / (4) =	46.2327	(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	1188.4338	918.6340	756.6616	388.2157	124.7368	0.0000	0.0000	0.0000	0.0000	407.4071	829.0735	1208.4566	(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)	1287.5772	995.2698	819.7851	420.6020	135.1428	0.0000	0.0000	0.0000	0.0000	441.3945	898.2378	1309.2704	(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	259.9418	229.9455	244.6883	216.3681	210.5133	190.5525	188.8075	195.9009	197.5771	219.2540	231.7910	257.2903	(64)	
Efficiency of water heater (217)m	87.0382	86.8393	86.4184	85.3549	82.9272	79.8000	79.8000	79.8000	79.8000	85.4290	86.6644	79.8000	(216)	
Fuel for water heating, kWh/month	298.6524	264.7944	283.1438	253.4924	253.8533	238.7876	236.6009	245.4899	247.5903	256.6505	267.4581	295.4774	(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	32.8049	26.3173	23.6958	17.3606	13.4098	10.9559	12.2329	15.9008	20.6535	27.0985	30.6077	33.7167	(232)	

Full SAP Calculation Printout



Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-58.7623	-80.9358	-113.6489	-124.6748	-131.7978	-121.9914	-120.3889	-114.8819	-104.8586	-90.9885	-63.8835	-51.0223	(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	-39.2218	-81.7497	-161.1508	-240.1751	-315.8531	-316.8252	-313.1783	-266.0120	-196.0528	-116.3750	-52.1796	-31.0805	(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												6307.2795	(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												3141.9911	(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)												264.7545	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3307.6886	(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												6492.3365	(238)

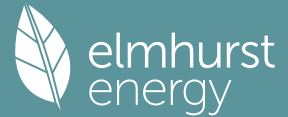
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6307.2795	0.2100	1324.5287	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3141.9911	0.2100	659.8181	(264)
Space and water heating			1984.3468	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.7545	0.1443	38.2123	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1177.8346	0.1351	-159.1412	
PV Unit electricity exported	-2129.8540	0.1261	-268.6149	
Total			-427.7561	(269)
Total CO2, kg/year			1606.7322	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7600	(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	6307.2795	1.1300	7127.2259	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3141.9911	1.1300	3550.4499	(278)
Space and water heating			10677.6757	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.7545	1.5338	406.0892	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1177.8346	1.4994	-1766.0282	
PV Unit electricity exported	-2129.8540	0.4630	-986.0218	
Total			-2752.0500	(283)
Total Primary energy kWh/year			8461.8158	(286)
Target Primary Energy Rate (TPER)			67.2000	(287)

Full SAP Calculation Printout



Property Reference	Plot 18	Issued on Date	07/11/2025
Assessment Reference	00001	Prop Type Ref	
Property			
SAP Rating	79 C	DER	4.47
Environmental	96 A	% DER < TER	64.38
CO ₂ Emissions (t/year)	0.51	DFEE	46.45
Compliance Check	See BREL	% DFEE < TFEE	9.70
% DPER < TPER	28.27	DPER	47.36
		TPER	66.02
Assessor Details	Ms. Vanessa Vienna	Assessor ID	T798-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	66.9000 (1b)	x 2.5000 (2b)	= 167.2500 (1b) - (3b)
First floor	59.0000 (1c)	x 3.7900 (2c)	= 223.6100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 390.8600 (5)

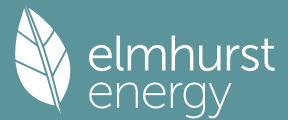
2. Ventilation rate

	m ³ per hour											
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												0 * 10 = 0.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) = 0.0000 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												3.0000 (17)
Infiltration rate												0.1500 (18)
Number of sides sheltered												0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.1500 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												83.7000 (23c)
Effective ac	0.2727	0.2690	0.2652	0.2465	0.2427	0.2240	0.2240	0.2202	0.2315	0.2427	0.2502	0.2577 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			17.0800	1.1450	19.5573		(27)
Solid door			1.8900	1.2000	2.2680		(26)
Roof light			3.6000	1.1450	4.1221		(27a)
Heatloss Floor 1			66.9000	0.1000	6.6900	110.0000	7359.0000 (28a)
External Wall 1	187.4000	18.9700	168.4300	0.1300	21.8959	190.0000	32001.6988 (29a)
pitched roof	91.9000	3.6000	88.3000	0.1000	8.8300	9.0000	794.7000 (30)
Total net area of external elements Aum(A, m ²)					346.2000		(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.3633		(33)
Main dwelling							
Party Floor 1			130.7600			80.0000	10460.8000 (32d)
Internal Wall 1			43.9700			9.0000	395.7300 (32c)
Internal Floor 1			59.0000			18.0000	1062.0000 (32d)
Internal Ceiling 1			59.0000			9.0000	531.0000 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 52604.9289 (34)
417.8310 (35)

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	21.2000	0.0900	1.9080
E5 Ground floor (normal)	38.1300	0.1600	6.1008
E6 Intermediate floor within a dwelling	29.8000	0.0700	2.0860
E13 Gable (insulation at rafter level)	27.0000	0.0400	1.0800
R8 Roof to wall (rafter)	27.4000	0.1200	3.2880
R4 Ridge (vaulted ceiling)	13.7000	0.1200	1.6440
E2 Other lintels (including other steel lintels)	12.4000	0.2000	2.4800
E3 Sill	11.5000	0.0400	0.4600
E4 Jamb	38.3400	0.0500	1.9170
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			20.9638 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	84.3271 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.1803	34.6966	34.2130	31.7945	31.3108	28.8924	28.8924	28.4087	29.8597	31.3108	32.2782	33.2456	(38)
Heat transfer coeff	119.5074	119.0237	118.5400	116.1216	115.6379	113.2195	113.2195	112.7358	114.1868	115.6379	116.6053	117.5727	(39)
Average = Sum(39)m / 12 =												116.0007	
HLP	0.9492	0.9454	0.9415	0.9223	0.9185	0.8993	0.8993	0.8954	0.9070	0.9185	0.9262	0.9339	(40)
HLP (average)												0.9214	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8835 (42)
Hot water usage for mixer showers	72.5668	71.4762	69.8871	66.8466	64.6028	62.1005	60.6782	62.2553	63.9841	66.6708	69.7766	72.2887	(42a)
Hot water usage for baths	31.3293	30.8640	30.2088	29.0007	28.0961	27.0930	26.5512	27.2018	27.9103	28.9836	30.2166	31.2234	(42b)
Hot water usage for other uses	44.1600	42.5542	40.9484	39.3426	37.7367	36.1309	36.1309	37.7367	39.3426	40.9484	42.5542	44.1600	(42c)
Average daily hot water use (litres/day)												136.0968	(43)
Daily hot water use	148.0561	144.8945	141.0443	135.1899	130.4356	125.3244	123.3603	127.1939	131.2369	136.6027	142.5474	147.6721	(44)
Energy conte	234.4847	206.3278	216.7798	185.0682	175.5914	154.1010	149.1936	157.4926	161.8282	185.3686	203.0849	231.2189	(45)
Energy content (annual)										Total = Sum(45)m =		2260.5397	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	35.1727	30.9492	32.5170	27.7602	26.3387	23.1152	22.3790	23.6239	24.2742	27.8053	30.4627	34.6828	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.2480	(55)
Total storage loss	38.6880	34.9440	38.6880	37.4400	38.6880	37.4400	38.6880	38.6880	37.4400	38.6880	37.4400	38.6880	(56)
If cylinder contains dedicated solar storage													
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(57)
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	304.3339	269.4174	286.6290	252.6642	245.4406	214.0530	211.1440	219.4430	221.7802	255.2178	270.6809	301.0681	(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	304.3339	269.4174	286.6290	252.6642	245.4406	214.0530	211.1440	219.4430	221.7802	255.2178	270.6809	301.0681	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3051.8721	(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	133.8455	119.0757	127.9587	115.6120	114.2635	99.2002	99.1672	101.9266	101.7695	117.5144	121.6025	132.7596	(65)

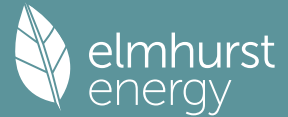
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2499	168.5624	152.2499	157.3249	152.2499	157.3249	152.2499	152.2499	157.3249	152.2499	157.3249	152.2499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	292.7079	295.7453	288.0912	271.7964	251.2272	231.8951	218.9801	215.9427	223.5968	239.8915	260.4607	279.7929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	(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)	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	(71)
Water heating gains (Table 5)	179.8999	177.1959	171.9874	160.5722	153.5800	137.7780	133.2892	136.9981	141.3465	157.9495	168.8924	178.4404	(72)
Total internal gains	691.1103	707.7563	678.5812	655.9462	623.3098	593.2507	570.7719	571.4434	588.5209	616.3436	652.9307	676.7358	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	7.0000	19.6403	0.5500	0.7000	0.7700	36.6808 (76)
South	6.4600	46.7521	0.5500	0.7000	0.7700	80.5800 (78)

Full SAP Calculation Printout



West			3.6200		19.6403		0.5500		0.7000		0.7700		18.9692 (80)
North			1.8000		26.0000		0.5500		0.7000		1.0000		16.2162 (82)
South			1.8000		26.0000		0.5500		0.7000		1.0000		16.2162 (82)

Solar gains	168.6625	308.1922	467.1383	638.5784	757.9327	768.0479	734.2236	644.8949	527.5699	353.8452	206.0681	141.5879	(83)
Total gains	859.7728	1015.9485	1145.7195	1294.5246	1381.2425	1361.2987	1304.9955	1216.3383	1116.0908	970.1888	858.9988	818.3237	(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	122.2726	122.7695	123.2704	125.8377	126.3641	129.0633	129.0633	129.6171	127.9699	126.3641	125.3158	124.2847	
alpha	9.1515	9.1846	9.2180	9.3892	9.4243	9.6042	9.6042	9.6411	9.5313	9.4243	9.3544	9.2856	
util living area													
	0.9997	0.9986	0.9919	0.9364	0.7610	0.5317	0.3817	0.4263	0.6982	0.9714	0.9988	0.9998	(86)
Living	20.4803	20.5805	20.7171	20.8841	20.9565	20.9672	20.9675	20.9676	20.9636	20.8553	20.6397	20.4710	
Non living	19.5163	19.6472	19.8229	20.0338	20.1032	20.1263	20.1265	20.1299	20.1181	20.0096	19.7374	19.5156	
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	20.7342	20.5805	20.7171	20.8841	20.9565	20.9672	20.9675	20.9676	20.9636	20.8553	20.6397	20.5450	(87)
Th 2	20.1259	20.1291	20.1323	20.1486	20.1518	20.1681	20.1681	20.1714	20.1616	20.1518	20.1453	20.1388	(88)
util rest of house													
	0.9996	0.9978	0.9874	0.9078	0.6994	0.4629	0.3096	0.3495	0.6177	0.9517	0.9979	0.9997	(89)
MIT 2	19.8828	19.6472	19.8229	20.0338	20.1032	20.1263	20.1265	20.1299	20.1181	20.0096	19.7374	19.6279	(90)
Living area fraction										FLA = Living area / (4) =		0.1712	(91)
MIT	20.0286	19.8070	19.9759	20.1794	20.2492	20.2703	20.2704	20.2733	20.2628	20.1544	19.8919	19.7849	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0286	19.8070	19.9759	20.1794	20.2492	20.2703	20.2704	20.2733	20.2628	20.1544	19.8919	19.7849	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9996	0.9974	0.9863	0.9090	0.7068	0.4714	0.3184	0.3590	0.6276	0.9517	0.9976	0.9997	(94)
Useful gains	859.4095	1013.3476	1130.0615	1176.6611	976.2145	641.7368	415.5587	436.6426	700.4816	923.3706	856.9045	818.0694	(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	1879.6788	1774.2839	1597.4388	1309.7786	988.6148	641.9854	415.5635	436.6570	703.7117	1104.8456	1491.5978	1832.3563	(97)
Space heating kWh	759.0803	511.3492	347.7288	95.8446	9.2259	0.0000	0.0000	0.0000	0.0000	135.0175	456.9792	754.6295	(98a)
Space heating requirement - total per year (kWh/year)												3069.8548	
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													
	759.0803	511.3492	347.7288	95.8446	9.2259	0.0000	0.0000	0.0000	0.0000	135.0175	456.9792	754.6295	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3069.8548	
Space heating per m2										(98c) / (4) =		24.3833	(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 %)													362.4097 (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	759.0803	511.3492	347.7288	95.8446	9.2259	0.0000	0.0000	0.0000	0.0000	135.0175	456.9792	754.6295	(98)
Space heating efficiency (main heating system 1)	362.4097	362.4097	362.4097	362.4097	362.4097	0.0000	0.0000	0.0000	0.0000	362.4097	362.4097	362.4097	(210)
Space heating fuel (main heating system)	209.4536	141.0970	95.9491	26.4465	2.5457	0.0000	0.0000	0.0000	0.0000	37.2555	126.0946	208.2255	(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	304.3339	269.4174	286.6290	252.6642	245.4406	214.0530	211.1440	219.4430	221.7802	255.2178	270.6809	301.0681	(64)
Efficiency of water heater (217)m	177.2228	177.2228	177.2228	177.2228	177.2228	177.2228	177.2228	177.2228	177.2228	177.2228	177.2228	177.2228	(216)
Fuel for water heating, kWh/month	171.7239	152.0219	161.7338	142.5687	138.4927	120.7819	119.1405	123.8233	125.1421	144.0096	152.7348	169.8812	(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	36.8546	33.2880	36.8546	35.6657	36.8546	35.6657	36.8546	36.8546	35.6657	36.8546	35.6657	36.8546	(231)
Lighting	108.5792	87.1063	78.4295	57.4608	44.3844	36.2624	40.4889	52.6291	68.3599	89.6919	101.3068	111.5970	(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													

Full SAP Calculation Printout



Space heating fuel - main system 1	847.0674 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	177.2228
Water heating fuel used	1722.0543 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)	
mechanical ventilation fans (SFP = 0.9100)	433.9328 (230a)
Total electricity for the above, kWh/year	433.9328 (231)
Electricity for lighting (calculated in Appendix L)	876.2964 (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	3879.3509 (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	847.0674	0.1577	133.5623 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1722.0543	0.1411	242.9210 (264)
Space and water heating			376.4833 (265)
Pumps, fans and electric keep-hot	433.9328	0.1387	60.1918 (267)
Energy for lighting	876.2964	0.1443	126.4767 (268)
Total CO2, kg/year			563.1518 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	847.0674	1.5837	1341.4902 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1722.0543	1.5216	2620.3085 (278)
Space and water heating			3961.7987 (279)
Pumps, fans and electric keep-hot	433.9328	1.5128	656.4535 (281)
Energy for lighting	876.2964	1.5338	1344.0927 (282)
Total Primary energy kWh/year			5962.3449 (286)
Dwelling Primary energy Rate (DPER)			47.3600 (287)

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

1. Overall dwelling characteristics

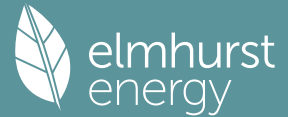
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	66.9000 (1b)	x 2.5000 (2b)	= 167.2500 (1b) - (3b)
First floor	59.0000 (1c)	x 3.7900 (2c)	= 223.6100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	125.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 390.8600 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1023 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3523 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3523 (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)

Full SAP Calculation Printout



Adj infilt rate	0.4492	0.4404	0.4316	0.3876	0.3788	0.3347	0.3347	0.3259	0.3523	0.3788	0.3964	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5786	0.5857 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			17.0800	1.1450	19.5573		(27)
TER Roof Light			3.6000	1.5918	7.2794		(27a)
Heatloss Floor 1			66.9000	0.1300	8.6970		(28a)
External Wall 1	187.4000	18.9700	168.4300	0.1800	30.3174		(29a)
pitched roof	91.9000	3.6000	88.3000	0.1100	9.7130		(30)
Total net area of external elements Aum(A, m2)			346.2000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 77.4541		(33)

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

417.8310 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	21.2000	0.0900	1.9080
E5 Ground floor (normal)	38.1300	0.1600	6.1008
E6 Intermediate floor within a dwelling	29.8000	0.0000	0.0000
E13 Gable (insulation at rafter level)	27.0000	0.0800	2.1600
R8 Roof to wall (rafter)	27.4000	0.0600	1.6440
R4 Ridge (vaulted ceiling)	13.7000	0.0800	1.0960
E2 Other lintels (including other steel lintels)	12.4000	0.0500	0.6200
E3 Sill	11.5000	0.0500	0.5750
E4 Jamb	38.3400	0.0500	1.9170

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

16.0208 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 93.4749 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
77.5069	77.0016	76.5062	74.1794	73.7440	71.7175	71.7175	71.3422	72.4981	73.7440	74.6247	75.5454	(38)
Heat transfer coeff	170.9818	170.4764	169.9810	167.6542	167.2189	165.1923	165.1923	164.8170	165.9729	167.2189	168.0996	169.0203 (39)
Average = Sum(39)m / 12 =												167.6522

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.3581	1.3541	1.3501	1.3316	1.3282	1.3121	1.3121	1.3091	1.3183	1.3282	1.3352	1.3425	(40)
HLP (average)												1.3316
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8835 (42)
Hot water usage for mixer showers	72.5668	71.4762	69.8871	66.8466	64.6028	62.1005	60.6782	62.2553	63.9841	66.6708	69.7766	72.2887 (42a)
Hot water usage for baths	31.3293	30.8640	30.2088	29.0007	28.0961	27.0930	26.5512	27.2018	27.9103	28.9836	30.2166	31.2234 (42b)
Hot water usage for other uses	44.1600	42.5542	40.9484	39.3426	37.7367	36.1309	36.1309	37.7367	39.3426	40.9484	42.5542	44.1600 (42c)
Average daily hot water use (litres/day)												136.0968 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
148.0561	144.8945	141.0443	135.1899	130.4356	125.3244	123.3603	127.1939	131.2369	136.6027	142.5474	147.6721	(44)
Energy conte	234.4847	206.3278	216.7798	185.0682	175.5914	154.1010	149.1936	157.4926	161.8282	185.3686	203.0849	231.2189 (45)
Energy content (annual)										Total = Sum(45)m =		2260.5397
Distribution loss (46)m = 0.15 x (45)m	35.1727	30.9492	32.5170	27.7602	26.3387	23.1152	22.3790	23.6239	24.2742	27.8053	30.4627	34.6828 (46)

Water storage loss:

Store volume

300.0000 (47)

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

2.1127 (48)

Temperature factor from Table 2b

0.5400 (49)

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

1.1409 (55)

Total storage loss

35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (56)
If cylinder contains dedicated solar storage												
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

293.1135	259.8288	275.4086	241.8057	234.2202	210.8386	207.8224	216.1214	218.5658	243.9975	259.8224	289.8477	(62)
WWHRS	-33.1745	-29.3398	-30.7229	-25.4398	-23.7090	-20.2880	-19.0167	-20.2224	-20.9907	-24.7457	-28.0339	-32.5602 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

259.9390	229.9430	244.6857	216.3659	210.5112	190.5506	188.8057	195.8990	197.5751	219.2517	231.7885	257.2876	(64)

12Total per year (kWh/year)

Total per year (kWh/year) = Sum(64)m = 2642.6031 (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

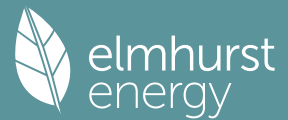
124.8692	110.9680	118.9823	106.9252	105.2872	96.6286	96.5099	99.2693	99.1979	108.5381	112.9158	123.7833	(65)
----------	----------	----------	----------	----------	---------	---------	---------	---------	----------	----------	----------	------

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	144.1754	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	152.2499	168.5624	152.2499	157.3249	152.2499	157.3249	152.2499	152.2499	157.3249	152.2499	157.3249	152.2499 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	292.7079	295.7453	288.0912	271.7964	251.2272	231.8951	218.9801	215.9427	223.5968	239.8915	260.4607	279.7929 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175	37.4175 (69)

Full SAP Calculation Printout



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)											
Water heating gains (Table 5)	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403	-115.3403 (71)
Total internal gains	167.8349	165.1310	159.9225	148.5072	141.5150	134.2064	129.7176	133.4265	137.7749	145.8846	156.8274	166.3754 (72)
	682.0454	698.6914	669.5162	646.8812	614.2449	589.6791	567.2003	567.8718	584.9493	607.2787	643.8657	667.6709 (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
East						7.0000	19.6403	0.6300	0.7000	0.7700		42.0162 (76)
South						6.4600	46.7521	0.6300	0.7000	0.7700		92.3007 (78)
West						3.6200	19.6403	0.6300	0.7000	0.7700		21.7284 (80)
North						1.8000	26.0000	0.6300	0.7000	1.0000		18.5749 (82)
South						1.8000	26.0000	0.6300	0.7000	1.0000		18.5749 (82)
Solar gains	193.1952	353.0202	535.0857	731.4626	868.1775	879.7640	841.0198	738.6978	604.3073	405.3136	236.0416	162.1825 (83)
Total gains	875.2406	1051.7116	1204.6019	1378.3438	1482.4223	1469.4431	1408.2201	1306.5696	1189.2566	1012.5923	879.9074	829.8533 (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	85.4622	85.7156	85.9654	87.1584	87.3853	88.4574	88.4574	88.6588	88.0413	87.3853	86.9275	86.4540
alpha	6.6975	6.7144	6.7310	6.8106	6.8257	6.8972	6.8972	6.9106	6.8694	6.8257	6.7952	6.7636
util living area	0.9997	0.9990	0.9959	0.9758	0.8921	0.6970	0.5135	0.5745	0.8559	0.9894	0.9992	0.9998 (86)
MIT	19.9250	20.0801	20.3127	20.6278	20.8733	20.9820	20.9980	20.9959	20.9305	20.5985	20.2068	19.9071 (87)
Th 2	19.7956	19.7987	19.8018	19.8161	19.8188	19.8314	19.8314	19.8337	19.8265	19.8188	19.8134	19.8077 (88)
util rest of house	0.9996	0.9984	0.9932	0.9598	0.8308	0.5818	0.3788	0.4324	0.7577	0.9798	0.9986	0.9997 (89)
MIT 2	18.5596	18.7606	19.0596	19.4618	19.7307	19.8249	19.8311	19.8330	19.7920	19.4348	18.9345	18.5458 (90)
Living area fraction	FLA = Living area / (4) =											0.1712 (91)
MIT	18.7933	18.9864	19.2740	19.6614	19.9263	20.0229	20.0308	20.0321	19.9869	19.6340	19.1523	18.7788 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7933	18.9864	19.2740	19.6614	19.9263	20.0229	20.0308	20.0321	19.9869	19.6340	19.1523	18.7788 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9994	0.9978	0.9915	0.9570	0.8373	0.6016	0.4020	0.4570	0.7733	0.9775	0.9980	0.9996 (94)
Useful gains	874.7087	1049.3950	1194.3302	1319.1100	1241.3060	884.0740	566.1088	597.1483	919.6405	989.8343	878.1837	829.5035 (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	2478.0930	2401.4007	2171.3454	1804.1861	1375.5913	895.8257	566.7453	598.6254	977.0592	1510.6493	2025.9836	2464.1189 (97)
Space heating kWh	1192.9179	908.5479	726.8993	349.2548	99.9083	0.0000	0.0000	0.0000	0.0000	387.4864	826.4160	1216.1539 (98a)
Space heating requirement - total per year (kWh/year)												5707.5844
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	1192.9179	908.5479	726.8993	349.2548	99.9083	0.0000	0.0000	0.0000	0.0000	387.4864	826.4160	1216.1539 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5707.5844
Space heating per m2										(98c) / (4) =		45.3343 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1192.9179	908.5479	726.8993	349.2548	99.9083	0.0000	0.0000	0.0000	0.0000	387.4864	826.4160	1216.1539 (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)	1292.4355	984.3422	787.5399	378.3909	108.2430	0.0000	0.0000	0.0000	0.0000	419.8119	895.3586	1317.6099 (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 requirement	259.9390	229.9430	244.6857	216.3659	210.5112	190.5506	188.8057	195.8990	197.5751	219.2517	231.7885	257.2876 (64)
Efficiency of water heater (217)m	87.0436	86.8223	86.3475	85.1274	82.4908	79.8000	79.8000	79.8000	79.8000	85.3227	86.6592	79.8000 (216)
Fuel for water heating, kWh/month	298.6308	264.8433	283.3734	254.1672	255.1935	238.7852	236.5986	245.4875	247.5878	256.9677	267.4713	295.4442 (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	31.6345	25.3784	22.8504	16.7412	12.9314	10.5651	11.7964	15.3335	19.9167	26.1317	29.5157	32.5138 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-58.7013	-80.8397	-113.5090	-124.5261	-131.6530	-121.8635	-120.2483	-114.7217	-104.6944	-90.8539	-63.8053	-50.9695 (233a)

Full SAP Calculation Printout



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	-39.2535	-81.7972	-161.2085	-240.2147	-315.8641	-316.8221	-313.1893	-266.0585	-196.1271	-116.4476	-52.2231	-31.1088	(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												6183.7318	(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												3144.5506	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												255.3088	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3306.7002	(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												6362.8909	(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	6183.7318	0.2100	1298.5837 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3144.5506	0.2100	660.3556 (264)
Space and water heating			1958.9393 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	255.3088	0.1443	36.8489 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1176.3858	0.1351	-158.9465
PV Unit electricity exported	-2130.3144	0.1261	-268.6838
Total			-427.6303 (269)
Total CO2, kg/year			1580.0872 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5500 (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	6183.7318	1.1300	6987.6169 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3144.5506	1.1300	3553.3422 (278)
Space and water heating			10540.9590 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	255.3088	1.5338	391.6012 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1176.3858	1.4994	-1763.8596
PV Unit electricity exported	-2130.3144	0.4630	-986.2752
Total			-2750.1349 (283)
Total Primary energy kWh/year			8312.5261 (286)
Target Primary Energy Rate (TPER)			66.0200 (287)