

Energy Statement

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New Dwellings

Coppid Hill House

Wokingham

RG42 4BS

Project Reference Number: ABBE 7531 / 7538

Client: Matthew Whatley

Date: 29/01/2025

Revision	Date	Changes	Prepared By
V1	29/01/2025	Draft report for review	James Rivers

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APPENDICES

- A. Floor plans
- B. Build Standards
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1.0. Executive Summary

Ashby Energy Assessors LTD were appointed to undertake an energy assessment of the proposed building. The works include the building of 16 new dwellings, details of the floor layout plans can be found in Appendix A.

This report aims to offer a preliminary estimation of the reduction in carbon emissions of the development, by using a range of appropriate measures to improve the energy efficiency of the building. It also demonstrates how the scheme delivers on the requirements of the Building Regulations and the local planning requirements of the Wokingham Borough Development Plan February 2014 Policy CC05 & CC04.

To further reduce carbon emissions and help in achieving the national net-zero target by 2050, an assessment of possible renewable and low carbon technologies that could be incorporated has also been included.

The analysis of CO₂ and energy usage is based on the government-approved national calculation method: SAP 10 'Standard Assessment Procedure'

A carbon emissions reduction over the Building Regulations Part L requirement by 55.74 – 57.43% was predicated for the whole site:

- Focusing on low U values for the new building to reduce carbon emissions by using efficient building fabric – these values have been independently assessed and calculated using specific materials and procedures.
- Installation of energy-efficient lighting and designing the building in a specific way to maximise natural light benefits where appropriate, allowing for solar gains to reduce energy usage.
- All dwelling will be designed for internal water useages of 105 litres/per person / per day.
- As Code for Sustainable Homes has ended no prevision for this requirement will be made.

Table 1 Summary of the carbon emissions of the development

Flats Total

	Total CO ₂ Emissions (kg CO ₂ /m ² /yr)	Cumulative CO ₂ Emission Reduction (kg CO ₂ /m ² /yr)	Cumulative CO ₂ Emissions Saving (%)
SAP 2021 Baseline (TER)	67.08	-	-
Be Lean - Proposed scheme after reducing energy use (DER)	67.08	64.08	4.47%
Be Clean - Proposed scheme after CHP (DER)	67.08	64.08	4.47%
Be Green - Proposed scheme after renewables (DER)	67.08	29.16	56.53%

Semi Detached Total

	Total CO ₂ Emissions (kg CO ₂ /m ² /yr)	Cumulative CO ₂ Emission Reduction (kg CO ₂ /m ² /yr)	Cumulative CO ₂ Emissions Saving (%)
SAP 2021 Baseline (TER)	70.7	-	-
Be Lean - Proposed scheme after reducing energy use (DER)	70.7	68.88	2.57%
Be Clean - Proposed scheme after CHP (DER)	70.7	68.88	2.57%
Be Green - Proposed scheme after renewables (DER)	70.7	55.74	55.74%

Detached Total

	Total CO ₂ Emissions (kg CO ₂ /m ² /yr)	Cumulative CO ₂ Emission Reduction (kg CO ₂ /m ² /yr)	Cumulative CO ₂ Emissions Saving (%)
SAP 2021 Baseline (TER)	29.88	-	-
Be Lean - Proposed scheme after reducing energy use (DER)	29.88	29.13	2.57%
Be Clean - Proposed scheme after CHP (DER)	29.88	29.13	2.57%
Be Green - Proposed scheme after renewables (DER)	29.88	55.74	57.43%

2.0. Introduction

This energy statement summarises the sustainable design stage considerations for the proposed new dwelling. Details of the floor layout plans can be found in Appendix A. The statement also conducts a renewable energy and low carbon technologies review.

The analysis of CO₂ and energy usage is based on the government-approved national calculation method SAP 10 'Standard Assessment Procedure'

This report aims to offer a preliminary estimation of the reduction in carbon emissions of the development through a range of appropriate measures to improve the energy efficiency of the building. It also demonstrates how the scheme delivers on the requirements of Building Regulations Part L and the local planning requirements.

The development is designed in accordance with the Energy Hierarchy to minimise CO₂ emissions, as follows:

1. Be Lean – use less energy by reducing the development's energy demand and improving the building fabric to be more thermally efficient.
2. Be Clean – supply energy efficiently by connecting to an existing district heating network where possible.
3. Be Green – use renewable energy sources to further offset the carbon emissions.

2.1. Site Location and Proposed Development

The site is located just off Edneys Hill Road Wokingham (see Figure 1). Details of the plans can be found in Appendix A – Building Plans. The floor plans show 16 new dwellings ranging from detached, semi detached & flats.

Figure 1 Site location in red



2.2. Planning Policy Context

2.2.1 National Planning Policy

The National Planning Policy Framework (2021) promotes the objective of sustainable development. New developments are encouraged to reduce greenhouse gas emissions and identify suitable areas for renewable and low-carbon energy sources.

The National Planning Policy Framework does not include a methodology on sustainable standards to adopt. These are addressed at the regional and local levels. The development and its carbon emissions have been compared with and must meet current Approved Document Part L1 Building Requirements.

2.2.2 Local Planning Policy

The site is located just off Edneys Hill Road Wokingham. The local planning authority is the Wokingham Borough Development Plan February 2014. The development must achieve the targets set within the Wokingham Borough Plan. Wokingham Borough Development Plan February 2014 Policy CC05 & CC04.

Policy CC05 - Renewable energy and decentralised energy networks

Policy CC05: Renewable energy and decentralised energy networks

1. Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged
2. Planning permission will only be granted for proposals that deliver a minimum 10% reduction in carbon emissions through renewable energy or low carbon technology where the development is for:
 - a) Schemes of more than 10 dwellings (gross), or
 - b) Non-residential proposals of more than 1,000 sq m gross floorspace.
3. Proposals for renewable energy and decentralised energy works, including wind turbines, must demonstrate that:
 - a) They are appropriate in scale, location and technology type;
 - b) Are compatible with the surrounding area, including the impact of noise and odour;
 - c) Do not have a damaging impact on the local topography and landscape;
 - d) There is no significant impact upon heritage assets, including views important to their setting;
 - e) In the case of wind turbines, take account of their cumulative effect and properly reflect their increasing impact on the landscape and on local amenity

Policy CC04 - Sustainable Design and Construction

Policy CC04: Sustainable Design and Construction

Planning permission will only be granted for proposals that seek to deliver high quality sustainably designed and constructed developments by:

1. In respect of all new homes:
 - a) Seeking to achieve the requirements of the full Code for Sustainable Homes Level 4;
 - b) Meet internal potable water consumption targets of 105 litres or less per person per day (as part of the requirement to meet full Code for Sustainable Homes Level 4).
2. All new non-residential proposals of more than 100 sq m gross non-residential floorspace shall at least:
 - a) Achieve the necessary mandatory Building Research Establishment Assessment Method (BREEAM) requirements or any future national equivalent
 - b) Meet or exceed statutory requirements for water resource management.
3. All development, including conversions, alterations and extensions shall incorporate suitable waste management facilities, including on-site recycling.

3.0. Be Lean – Use Less Energy

This energy statement uses the Energy Hierarchy approach to assess and achieve reduced carbon emissions, as promoted by the London Plan. This approach requires the development to be designed in a way that reduces energy consumption and carbon emissions before considering any centralised / decentralised heat or renewable energy sources.

3.1. Baseline Emission Rates

The notional building represents a development that meets the minimum requirements for CO₂ emissions, as defined in Building Regulations Part L 2021. The Dwelling Emission Rates (DER) are compared to the Target Emission Rates (TER) so that the reduction in CO₂ emissions can be calculated.

3.2. Design Specification

The design of this building has been optimized to maximise natural light where possible, allowing for solar gains to reduce energy usage.

With regards to improving the insulation of the building through a ‘fabric first’ approach, the achieved U-values are below the minimum current U-value requirement of the proposed Building Regulations

Part L 2021 (see Table 1). The building specification can be seen in more detail within the build standards in Appendix B.

Table 2 U-values for the proposed building

	Minimum Building Regulations Part L Requirements 2021	Proposed Building
Walls	0.26 W/m ² K	0.19 W/m ² K
Ground Floor	0.18 W/m ² K	0.11 W/m ² K
Roof	0.18 W/m ² K	0.11 W/m ² K
Windows	1.60 W/m ² K	1.20 W/m ² K
Doors	1.60 W/m ² K	1.20 W/m ² K

The building specification shows a reduction in building emissions of 2.51 – 4.47% against the baseline. Calculations of DER and TER were determined using the national approved method SAP (see table 3 below).

Table 3 Emission rates following ‘Be Lean’ measures

Flats Total

Dwelling Emission Rates (kg CO ₂ /m ² /yr)	Target Emission Rates (kg CO ₂ /m ² /yr)	Improvement (%)
10.68 X 6 = 64.08	11.18 X 6 = 67.08	4.47

Semi Detached Total

Dwelling Emission Rates (kg CO ₂ /m ² /yr)	Target Emission Rates (kg CO ₂ /m ² /yr)	Improvement (%)
9.84 X 7 = 68.88	10.10 X 7 = 70.7	2.57

Detached Total

Dwelling Emission Rates (kg CO ₂ /m ² /yr)	Target Emission Rates (kg CO ₂ /m ² /yr)	Improvement (%)
9.71 X 3 = 29.13	9.96 X 3 = 29.88	2.51

Further details of the specification can be found in Appendix B – Build Standards.

3.3. Be Lean Conclusion

By focusing on the building's fabric with good thermal properties, energy-efficient lighting and low flow rate showers, the development improves on Part L Building Regulation requirements by 2.51 – 4.47%

4.0. Be Clean – Supply Energy Efficiency

After the ‘Be Lean’ measures reducing the energy load of the development, the ‘Be Clean’ measures aim to provide the required energy load in an efficient and clean approach. Connection to community heating systems and use of combined heat and power plants are considered below.

4.1. Community Heating

Connection to an existing heating or cooling network is not considered appropriate. The energy distribution losses, as well as the high investment cost of the connection to a network, is not viable. There are no appropriate community heating networks for this development.

4.2. Combined Heat and Power (CHP)

Combined Heat and Power are not considered suitable for the following reasons:

- There is no appropriate space around the development for a large-scale combined heat and power plant, which would not disrupt the landscape of the development.
- Small scale/individual CHP would be appropriate but is significantly less efficient and provides less benefit than the other renewable options considered below.

4.3. Be Clean Conclusion

The use of community heating and combined heat and power are not appropriate for this development. There is no CHP network close enough to the development for connection to be currently viable both logistically and financially.

5.0. Be Green – Use Renewable Energy

The initial results from the SAP calculations without using renewable energy were used to generate the annual energy consumption figures. These figures were then used to determine the suitability of various renewable technologies to further improve the reduction in energy and carbon emissions within the building by using renewable energy sources. A selection of potential renewable and low-carbon energy sources has been considered. These are:

- Photovoltaic cells (PV)
- solar water heating
- wind turbines
- biomass
- hydropower
- air source heat pump (ASHP) technologies
- ground source heat pump (GSHP) technologies biomass
- hydropower

5.1. Photovoltaics (PV) – Suitable

Photovoltaic cells are panels that can be attached to the roof or walls of a building. Each cell is made of P-type and N-type semiconductors. P-N junction operates as a battery and creates an electric field which causes electrons to move towards the surface, where they are available for the electrodes. When photons of solar irradiance are absorbed by the PV plate, they create more holes and electrons, which are becoming available for direct current in an external load. The stronger the solar irradiance, the more electricity is produced. The greatest benefit from photovoltaics is seen when they are south-facing at an angle of 45 degrees with no shading.

Despite being suitable photovoltaics will not be considered within the final dwellings as the dwelling intend to use ASHP to achieve the 10%

5.2. Solar Hot Water – Not Suitable

Solar water heating systems use solar radiation to heat water directly, usually for domestic hot water purposes. The unit would be installed on the roof and the installation of solar hot water would require a suitable hot water cylinder so it can preheat the water.

The solar hot water panels would sit on the roof space. To maintain the solar hot water, access would need to be available to the roof and safety rails installed around the solar hot water for health and safety reasons. These rails would be at least 1.0 m high.

The system will produce relatively small CO₂ savings and will have a significant negative impact on the cost of the heating system as it requires great modification. The heat losses associated with transportation would cause the investment to not be viable. Therefore, solar thermal systems are not appropriate for this development.

5.3. Wind Turbines – Not Suitable

Wind turbines can range from small domestic turbines (1kW) to large commercial turbines (140m tall, 2MW). There are also different designs and styles (horizontal or vertical axis; 1 blade to multiple blades) that can be implemented in various locations depending on wind speed and direction. They generate renewable electricity that can be provided for use on-site or sold directly to the local electricity network. Vertical axis turbines have a lower performance than horizontal axis turbines but work better in urban environments.

There is no appropriate space for the installation of large/medium-scale wind turbines within the site because of the proximity of the dwellings. This would create noise that may potentially be disruptive and have a visual impact on the area, a common complaint associated with wind turbines. Therefore, wind turbines are not appropriate for this development.

5.4. Biomass – Not Suitable

Use of biomass fuels to run biomass boilers. The use of a large-scale biomass boiler has been considered for heating and hot water. The potential reduction in carbon emissions by installing biomass boilers can be considerable. However, although biomass systems have several advantages, in the context of this development, the following issues prevent the installation of biomass boilers:

- Likely significant negative impact on local air quality and odour
- Significantly higher capital costs in comparison with other heating systems
- Requirements of additional resources for the management of the operation
- The location of the development may not be suitable for large-scale fuel delivery
- Security of biomass supply, which must be sustainably grown to be considered renewable energy

5.5. Hydropower – Not Suitable

Hydropower is renewable energy produced by water in rivers. Electricity generated using hydropower is known as hydroelectricity. There are no rivers of any significant size within a close proximity of the site, therefore, this option has been considered not suitable for this development.

5.6. Heat Pump Technology

5.6.1. Air Source Heat Pump (ASHP) – Suitable

ASHP make use of the energy contained in the air to provide heating and domestic hot water to the building by using the vapour-compression refrigeration process. An 'air to water' ASHP can provide domestic hot water and space heating in a building on a small to medium scale.

ASHP would further help to provide the building with efficient, green and low carbon energy for heating while also supplying clean energy for hot water. This is especially important within this building as the majority of the energy demand comes from the hot water demand.

5.6.2. Ground Source Heat Pump (GSHP) – Not Suitable

GSHP technology makes use of the heat from the ground to provide heating and domestic hot water to the building. The heat is transferred from the ground by either extracting and discharging (re-charging) water from/to the ground directly (open loop) or circulating water (or refrigerant) through pipes buried within the ground (closed loop). The fluid passes through a heat pump, which uses electrical energy, to transfer the heat from the ground into a higher-temperature water circuit used for heating purposes.

The development is within a suburban environment which would cause complications with the installation of a GSHP. Therefore, GSHPs are not considered appropriate for this development.

5.7. Be Green Conclusion

Table 4 shows the cumulative reduction in carbon emissions considering all the Energy Hierarchy measures, including Be Lean, Be Clean and Be Green. The most appropriate renewable source of energy is an ASHP to supply the property with clean, renewable energy for both heating and hot water. The ASHP will deliver a total of 55.74-57.43% reduction in carbon emissions from the 'Be Lean' measures

Table 4 Emission rates following 'Be Green' measures

Flats Total

Dwelling Emission Rates (kg CO ₂ /m ² /yr)	Target Emission Rates (kg CO ₂ /m ² /yr)	Improvement (%)
4.86 X 6 = 29.16	11.18 X 6 = 67.08	56.53

Semi Detached Total

Dwelling Emission Rates (kg CO ₂ /m ² /yr)	Target Emission Rates (kg CO ₂ /m ² /yr)	Improvement (%)
4.47 X 7 = 31.29	10.10 X 7 = 70.7	55.74

Detached Total

Dwelling Emission Rates (kg CO ₂ /m ² /yr)	Target Emission Rates (kg CO ₂ /m ² /yr)	Improvement (%)
4.24 X 3 = 12.72	9.96 X 3 = 29.88	57.43

6.0. Water Efficiency

All dwellings will be designed to achieve an internal water consumption of 102.9 liters per person per day. This specification will be met by adhering to the following criteria.

<u>Type</u>	<u>Location</u>	<u>Required flow Rates, Volume</u>	<u>Qty</u>
Taps	All Taps	4 litres/min	All
Dishwasher	Kitchen	1.25 litres/place	All
Washing Machine	Kitchen	8.17 litres/kg	All
Bath	Family Bathroom	185litres to overflow	All
Shower	Family Bathroom	9 litres/min	All
WC's 'Dual Flush'	Ground Floor W/C	4 / 2 litres to flush vol.	All
Kitchen / Utility Taps (When applicable)	All Taps	4 litres/min	All

Job no:	ABBE7538
Date:	29/01/2025
Assessor name:	James Rivers
Registration no:	EES/022149
Development name:	ABBE_7531_7538_Coppid Hill House RG42 4BS

Dwelling Type:	1	2	3	4
Dwelling type description:	g - 105 Litres A			
WC	11.76	0.00	0.00	0.00
Taps (excluding kitchen taps)	7.90	0.00	0.00	0.00
Bath	20.35	0.00	0.00	0.00
Shower	39.33	0.00	0.00	0.00
Kitchen sink taps	12.12	0.00	0.00	0.00
Washing machine	17.16	0.00	0.00	0.00
Dishwasher	4.50	0.00	0.00	0.00
Waste Disposal Unit	0.00	0.00	0.00	0.00
Water Softener	0.00	0.00	0.00	0.00
Contribution from Greywater				
Contribution from Rainwater				
Contribution from Grey/Rainwater (combined system)				
Normalisation factor	0.91	0.91	0.91	0.91
Total Water Consumption	102.9	0.0	0.0	0.0
Code for Sustainable Homes - credits awarded	3	0	0	0
CSH Mandatory Level	Level 3/4	-	-	-
External Water Use	5	5	5	5
17. K - Litres/person/day	107.9	0.0	0.0	0.0
17. K Compliance?	Yes	-	-	-

6.0. Conclusion

The ambition of the development is to use a 'fabric first' approach before considering the use of renewable energy to offset carbon emissions. To help in achieving that goal, the Energy Hierarchy has been used as follows:

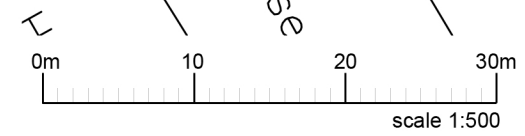
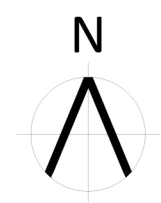
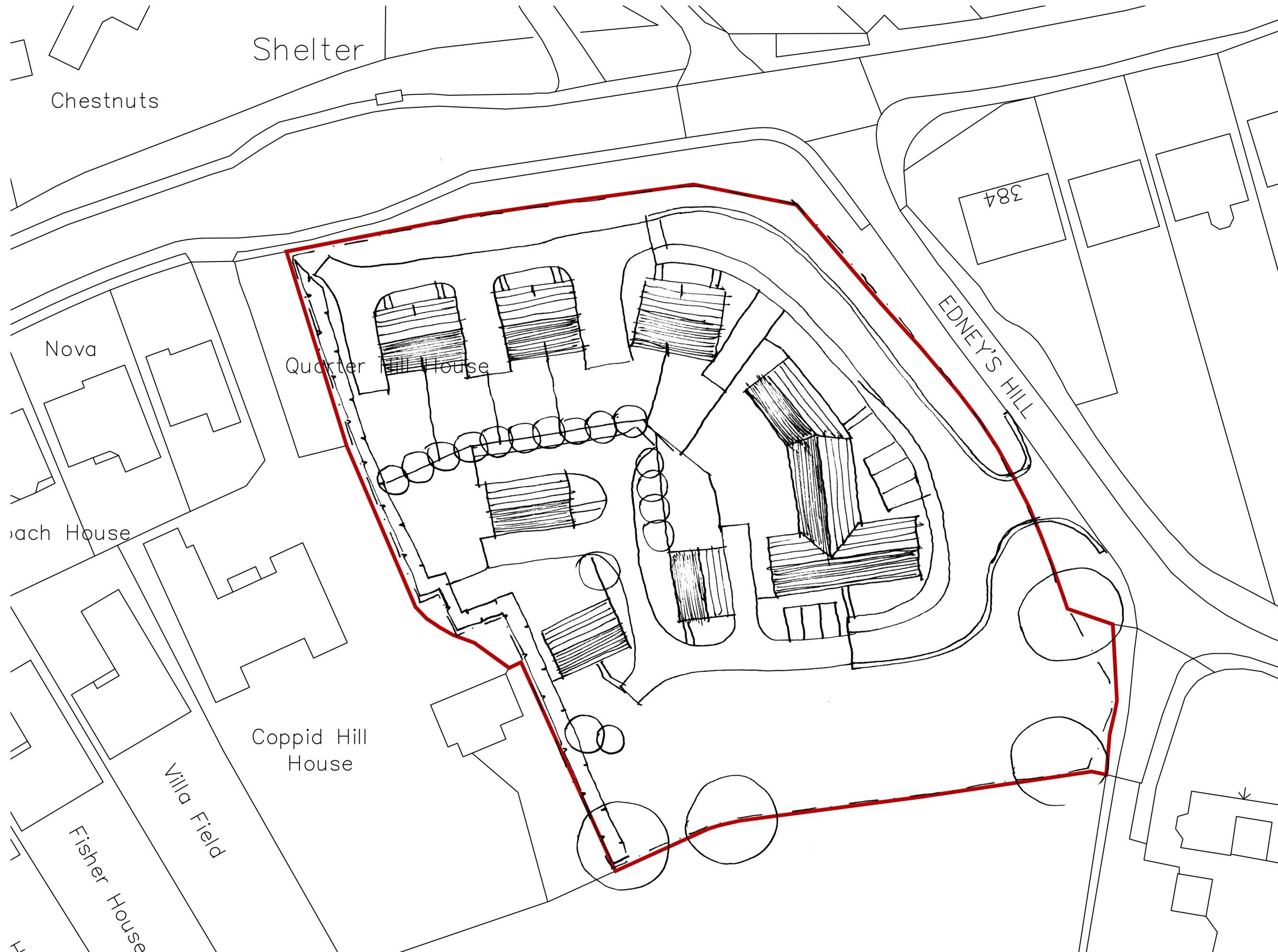
- Be lean – use less energy by reducing the development's energy demand.
- Be clean – supply energy efficiently by connecting to an existing district heating network where possible.
- Be green – use renewable energy sources to further offset carbon emissions.

Be Lean – By focusing on the building's fabric with good thermal properties, energy-efficient lighting and low flow rate showers, the development improves on Part L Building Regulation requirements by 2.51 – 4.47%

Be Clean - The use of community heating and combined heat and power are not appropriate for this development. There is no CHP network close enough to the development for connection to be currently viable both logistically and financially.

Be Green – Table 4 shows the cumulative reduction in carbon emissions considering all the Energy Hierarchy measures, including Be Lean, Be Clean and Be Green. The most appropriate renewable source of energy is an ASHP to supply the property with clean, renewable energy for both heating and hot water. The ASHP will deliver a total of 55.74-57.43% reduction in carbon emissions from the 'Be Lean' measures



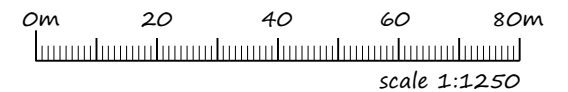


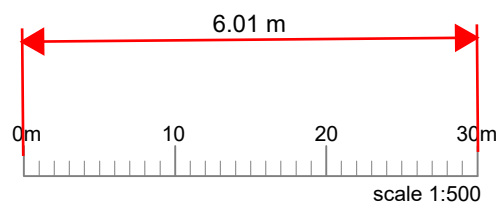
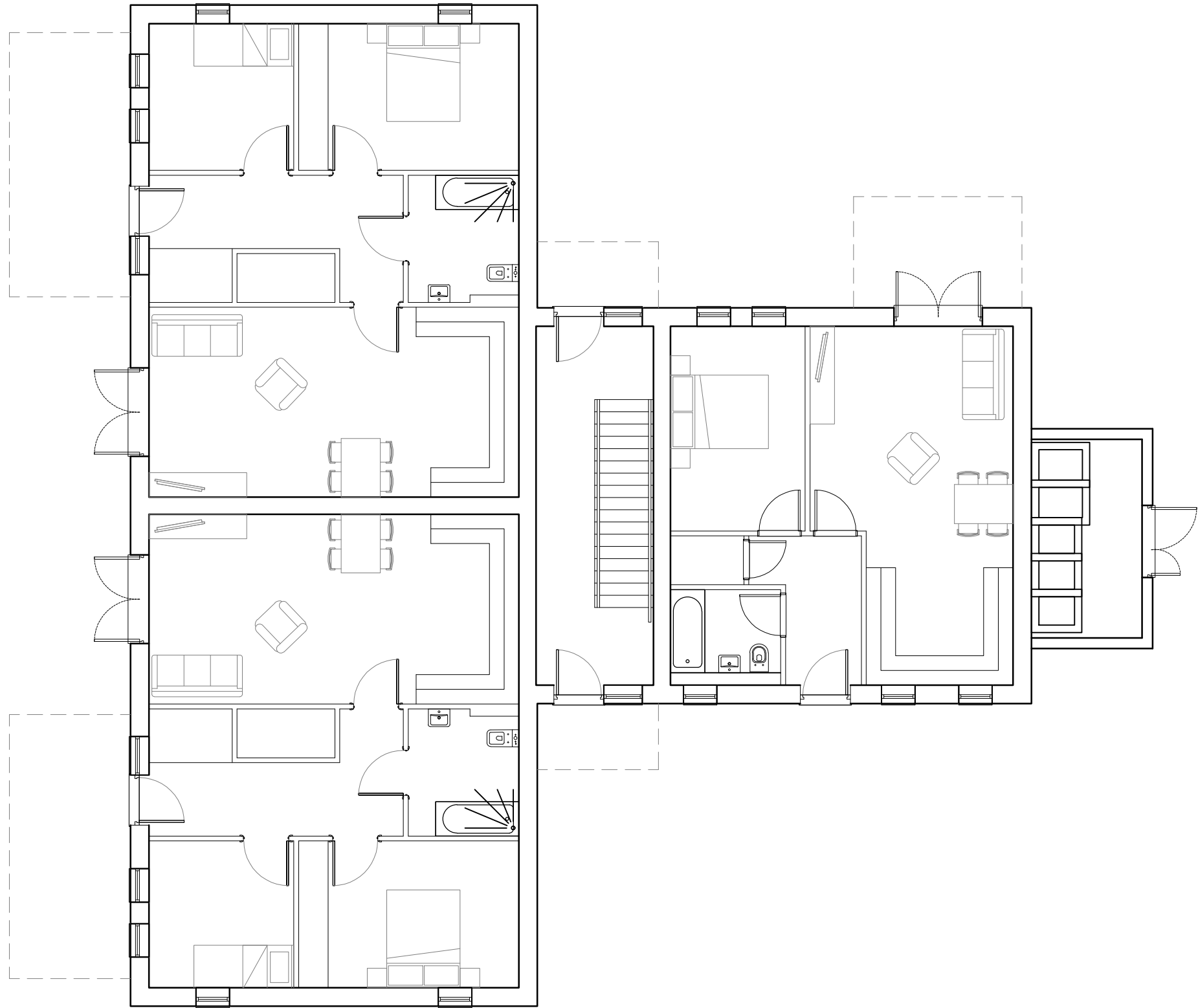
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TITLE INITIAL SKETCH LAYOUT OPTION 2		
DRAWING NUMBER WOK-SK002		REV P1
ABBEYMILL HOMES LTD.		
Market House Silver End Olney Bucks MK46 4AL		
T: 01234 714 844 W: abbeymillhomes.co.uk E: enquiries@abbeymillhomes.co.uk		



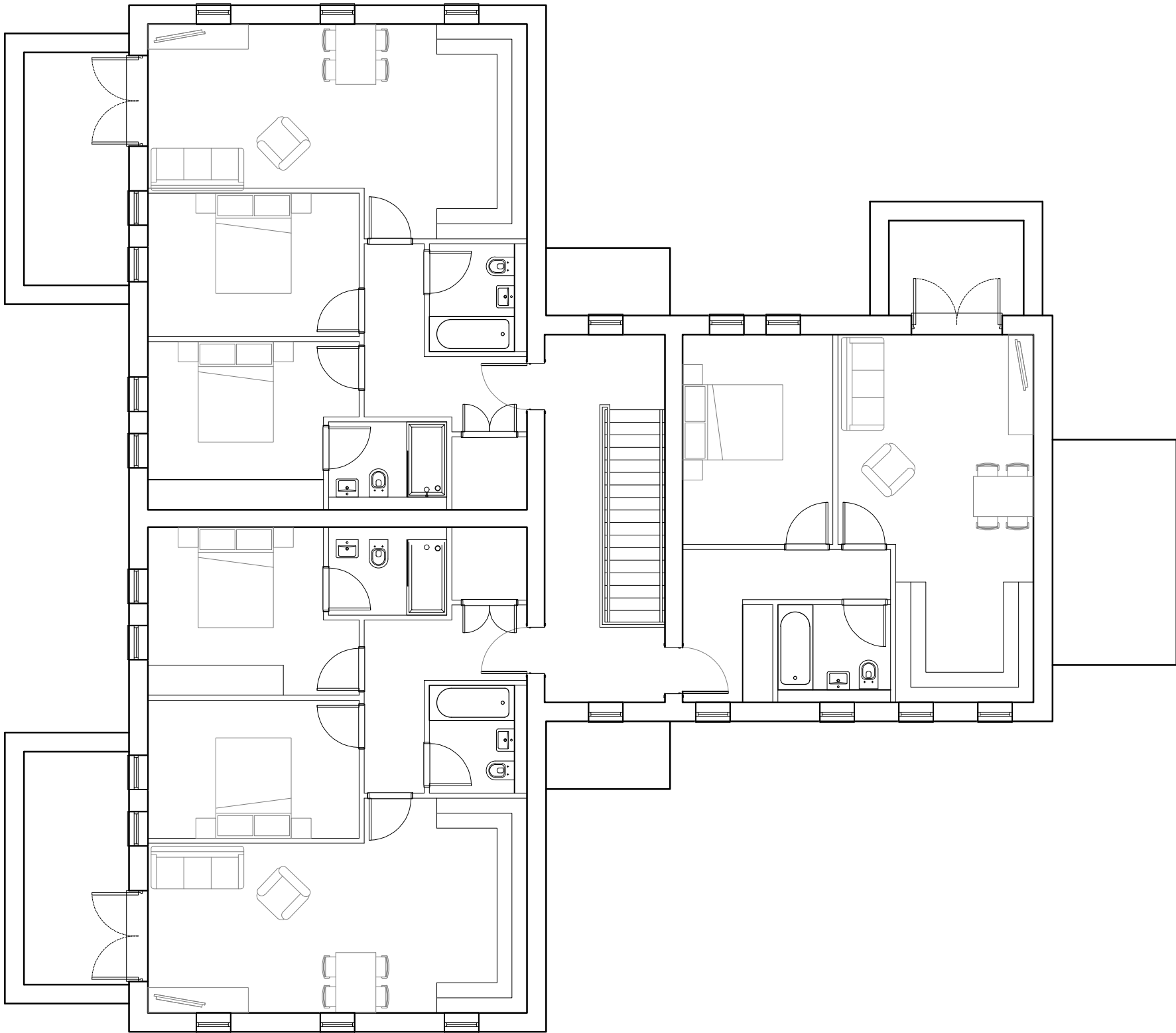
Abbeymill Homes

SITE LOCATION PLAN
1:1250 @ A4
COPPID HILL HOUSE, WOKINGHAM

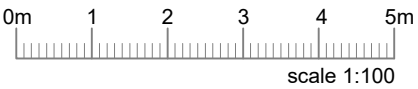




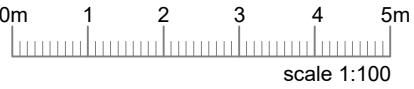
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PROJECT		
LAND OFF BARKHAM ROAD		
BARKHAM		
TITLE		
GROUND FLOOR PLANS		
APARTMENTS		
DRAWING NUMBER		REV
PL006		-
ABBEYMILL HOMES LTD.		
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Silver End		
Olney		
Bucks		
MK46 4AL		
T: 01234 714 844		
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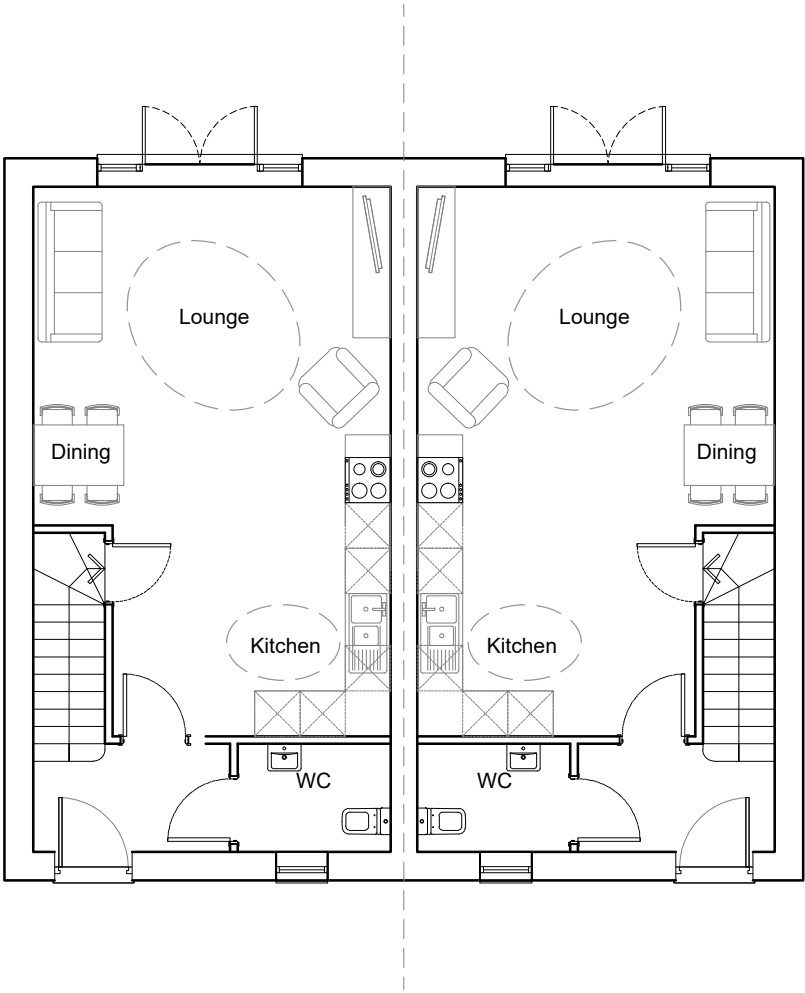
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ABBEMILL HOMES LTD. Market House Silver End Olney Bucks MK46 4AL T: 01234 714 844 W: abbeymillhomes.co.uk E: enquiries@abbeymillhomes.co.uk		



REVISIONS / AUTHOR		DATE
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CHECKED TN	SIGNED OFF TN	DATE JAN 2025
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DRAWING NUMBER		REV
PL008		-
<u>ABBEYMILL HOMES LTD.</u>		
Market House Silver End Olney Bucks MK46 4AL T: 01234 714 844 W: abbeymillhomes.co.uk E: enquiries@abbeymillhomes.co.uk		
		

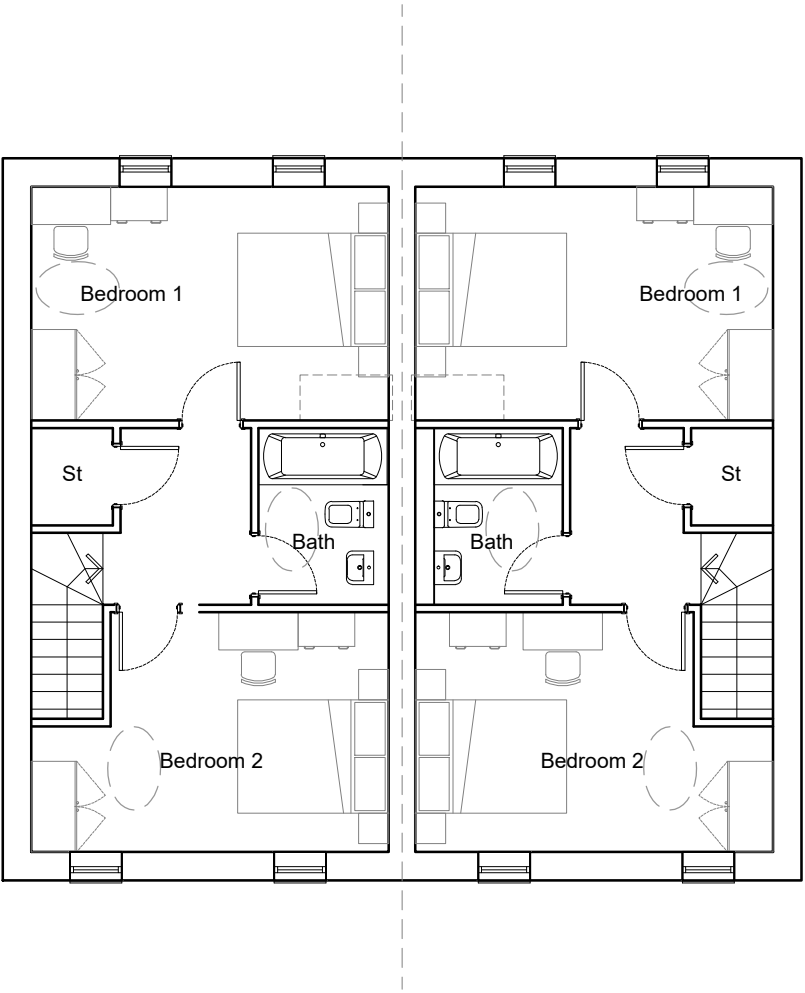


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GROUND FLOOR PLAN

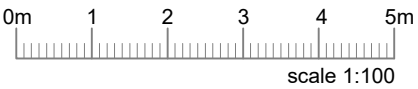
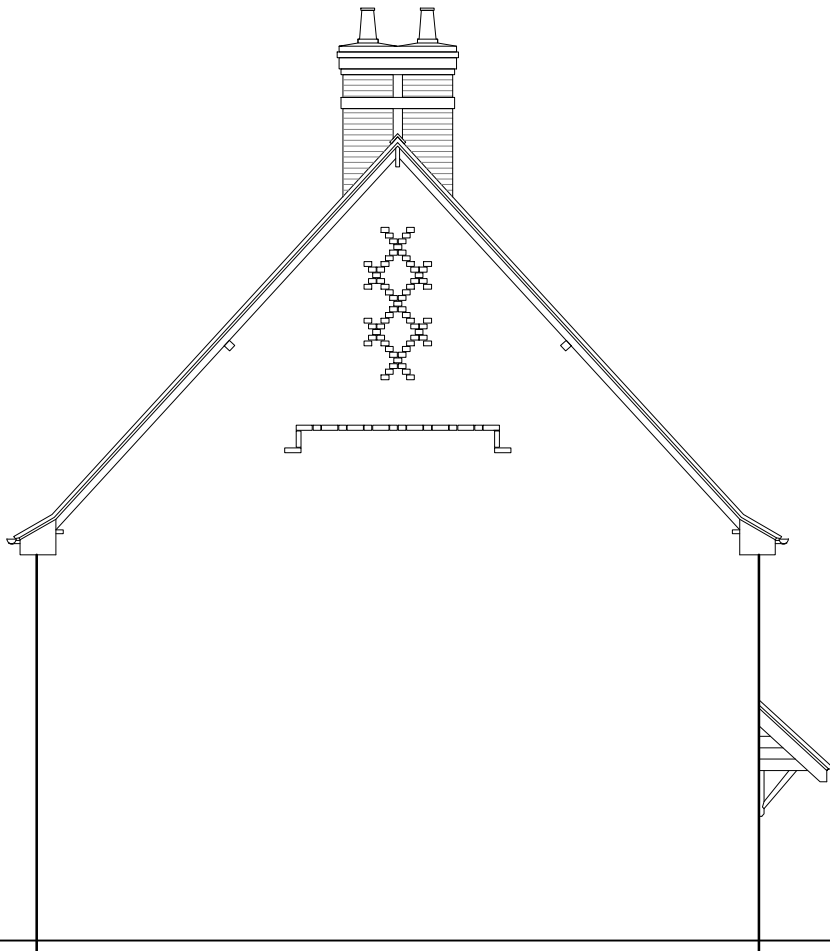
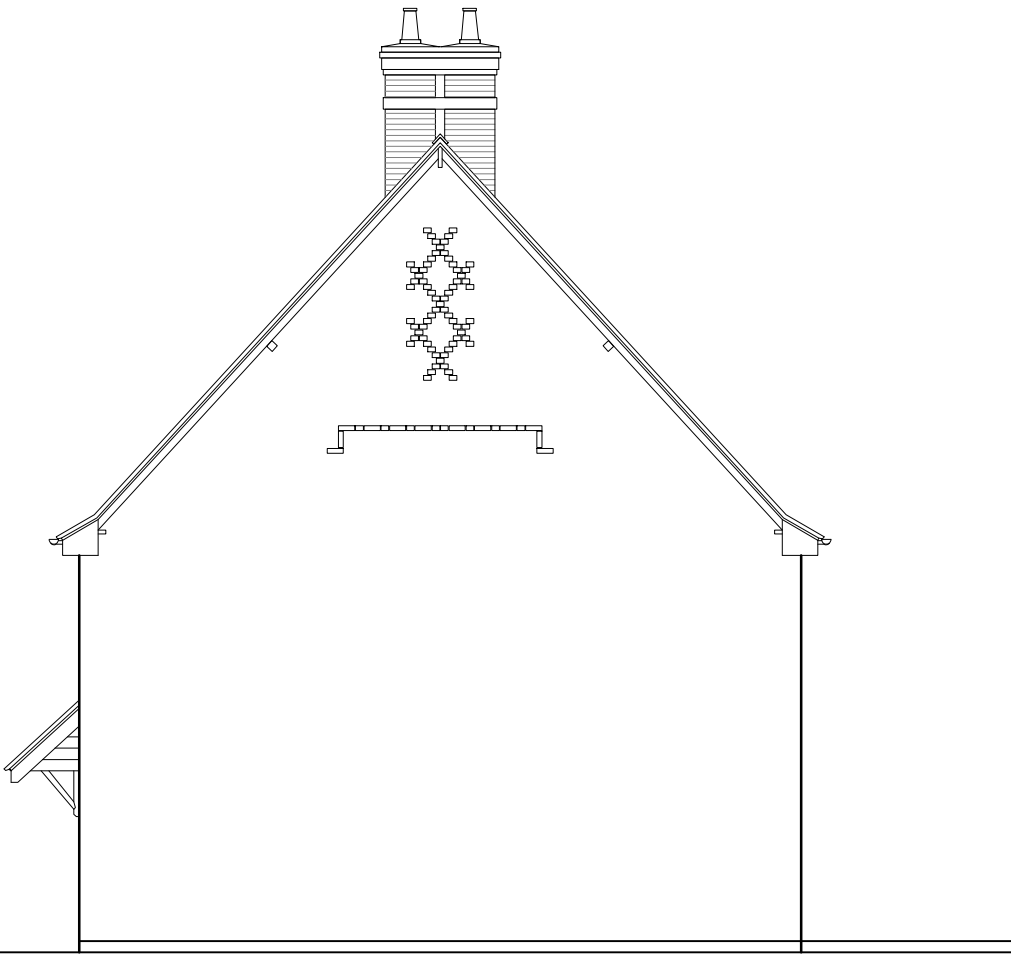
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FIRST FLOOR PLAN



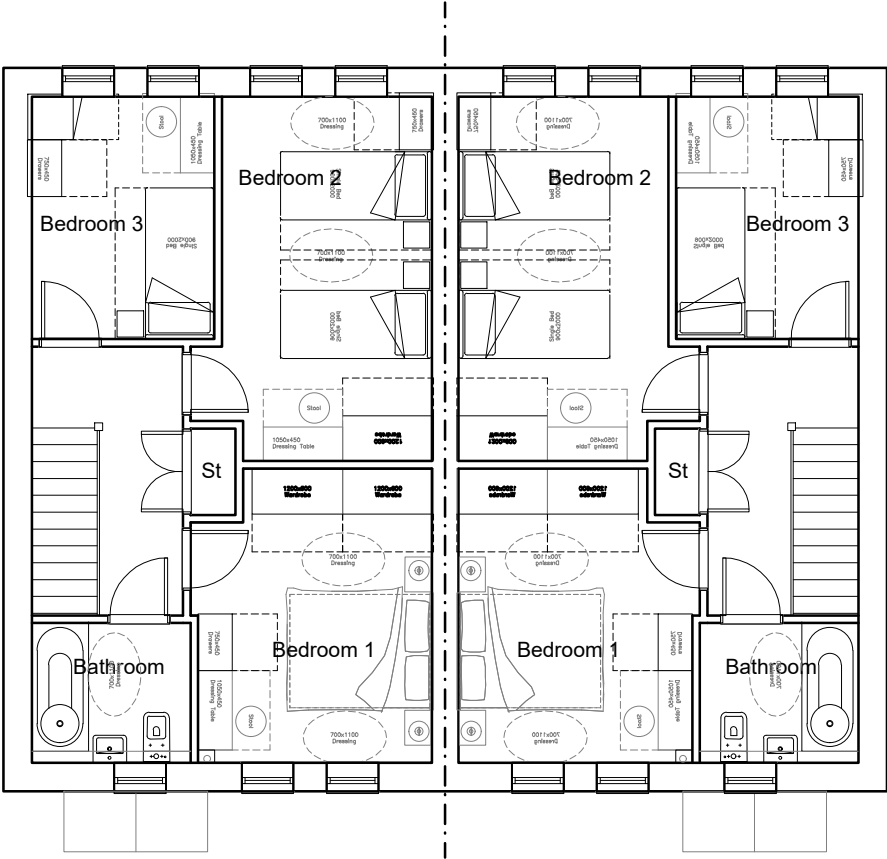
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ABBEYMILL HOMES LTD.			
Market House Silver End Olney Bucks MK46 4AL T: 01234 714 844 W: abbeymillhomes.co.uk E: enquiries@abbeymillhomes.co.uk			
			



REVISIONS / AUTHOR		DATE
PURPOSE OF ISSUE		
PLANNING		
DRAWN		SCALE
MW		1:100@A3
CHECKED	SIGNED OFF	DATE
TN	TN	JAN 2025
PROJECT		
LAND OFF BARKHAM ROAD		
BARKHAM		
TITLE		
ELEVATIONS		
HOUSE TYPE A		
DRAWING NUMBER		REV
PL011		-
ABBEYMILL HOMES LTD.		
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Bucks		
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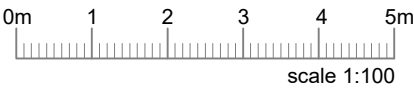
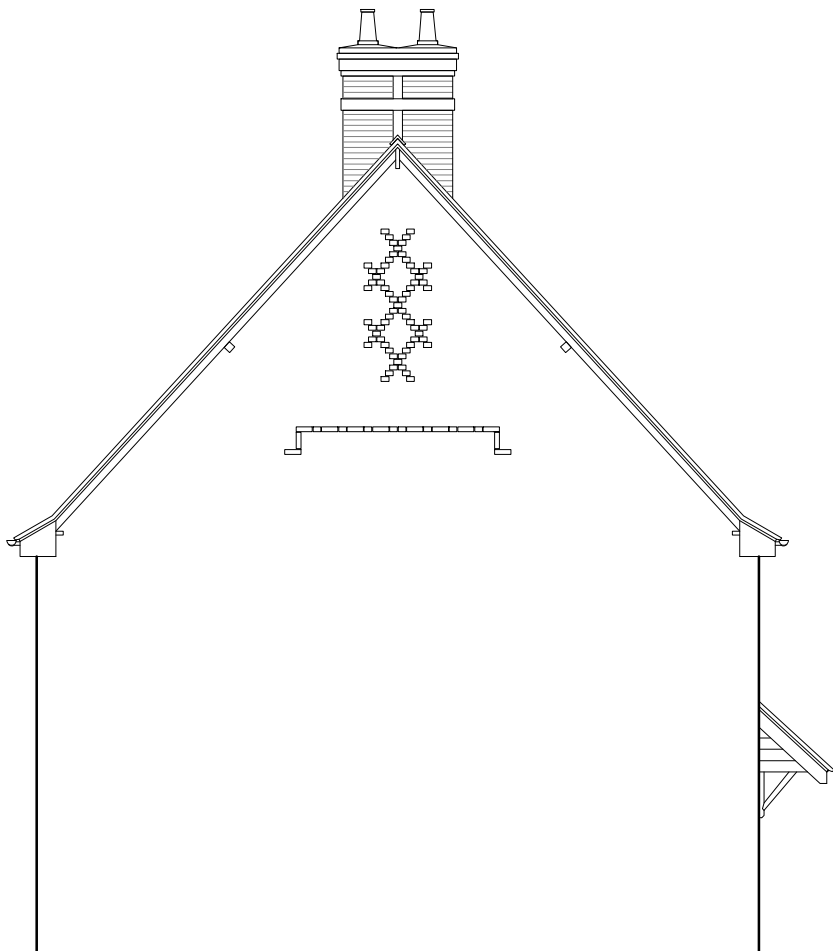
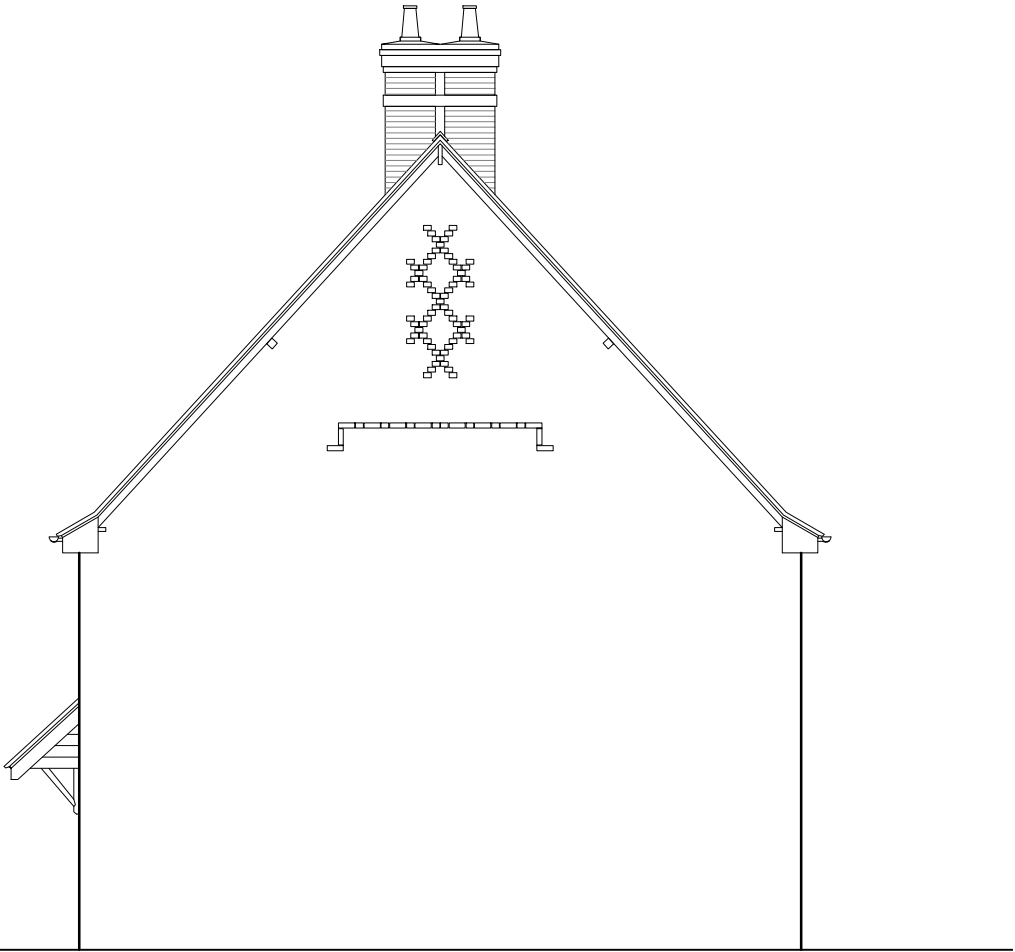
GROUND FLOOR PLAN



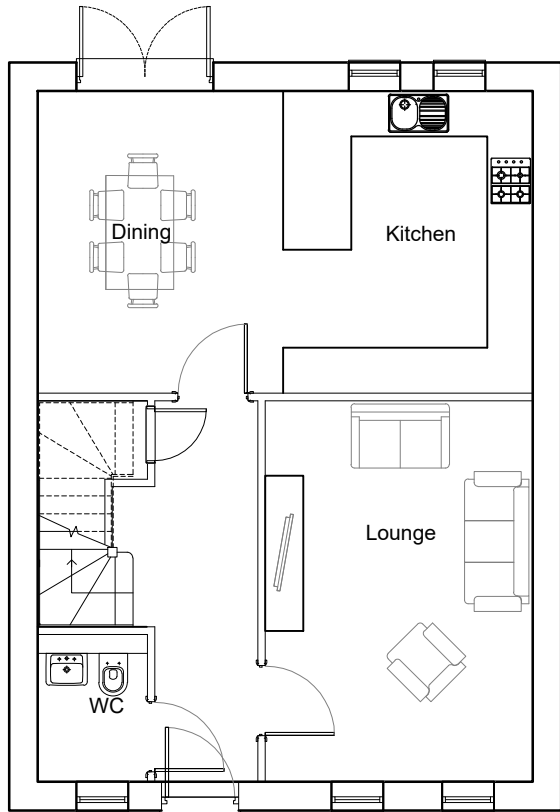
FIRST FLOOR PLAN



REVISIONS / AUTHOR			DATE
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PROJECT			
LAND OFF BARKHAM ROAD			
BARKHAM			
TITLE			
FLOOR PLANS			
HOUSE TYPE B			
DRAWING NUMBER			REV
PL012			-
<u>ABBEYMILL HOMES LTD.</u>			
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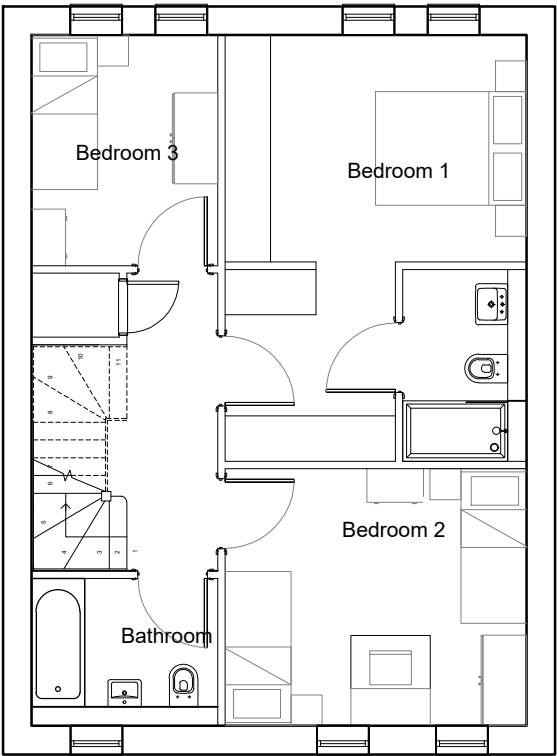


REVISIONS / AUTHOR		DATE
PURPOSE OF ISSUE		
PLANNING		
DRAWN MW		SCALE 1:100@A3
CHECKED TN	SIGNED OFF TN	DATE JAN 2025
PROJECT LAND OFF BARKHAM ROAD BARKHAM		
TITLE ELEVATIONS HOUSE TYPE B		
DRAWING NUMBER		REV
PL013		-
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GROUND FLOOR PLAN

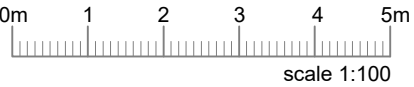
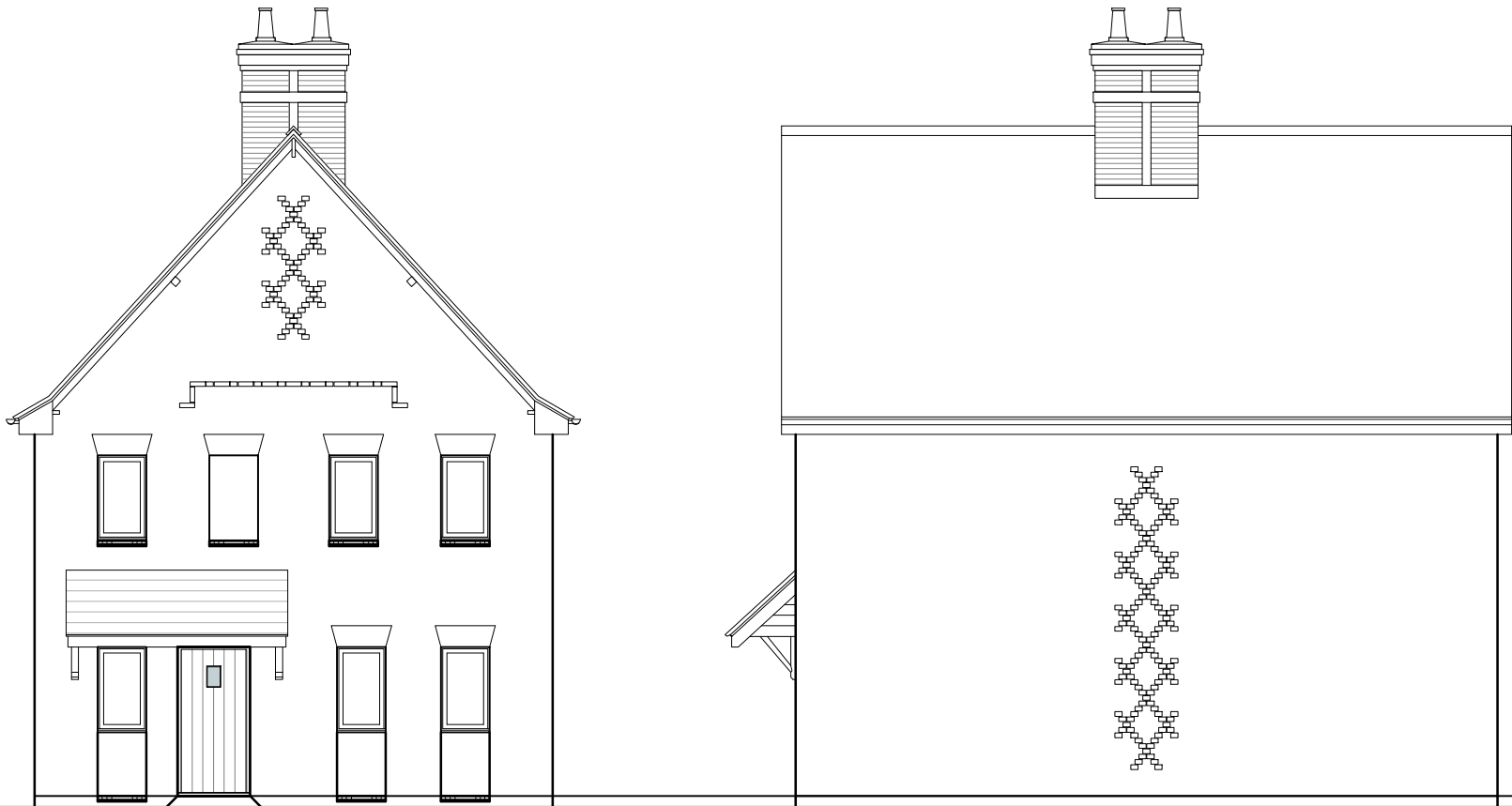
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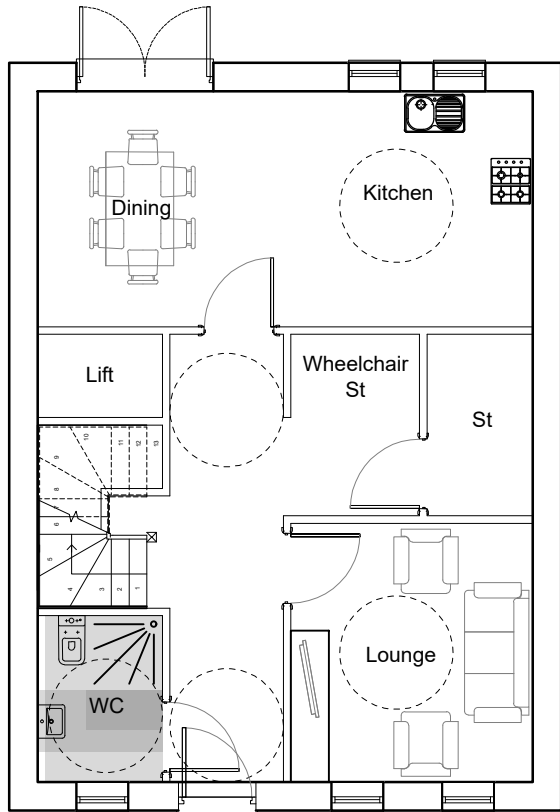
FIRST FLOOR PLAN



REVISIONS / AUTHOR		DATE
PURPOSE OF ISSUE PLANNING		
DRAWN MW		SCALE 1:100@A3
CHECKED TN	SIGNED OFF TN	DATE JAN 2025
PROJECT LAND OFF BARKHAM ROAD BARKHAM		
TITLE FLOOR PLANS HOUSE TYPE C		
DRAWING NUMBER PL014		REV -
ABBEYMILL HOMES LTD. Market House Silver End Olney Bucks MK46 4AL T: 01234 714 844 W: abbeymillhomes.co.uk E: enquiries@abbeymillhomes.co.uk		

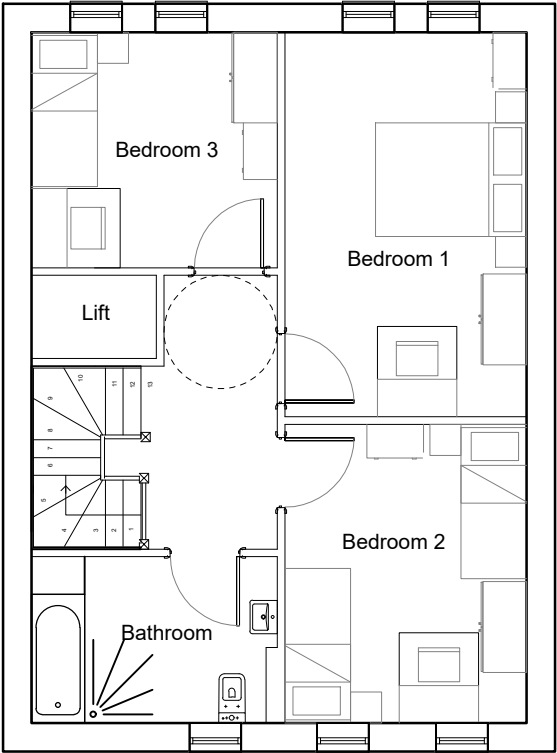


REVISIONS / AUTHOR			DATE
PURPOSE OF ISSUE			
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CHECKED	SIGNED OFF	DATE	
TN	TN	JAN 2025	
PROJECT			
LAND OFF BARKHAM ROAD			
BARKHAM			
TITLE			
ELEVATIONS			
HOUSE TYPE C			
DRAWING NUMBER			REV
PL015			-
<u>ABBEYMILL HOMES LTD.</u>			
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GROUND FLOOR PLAN

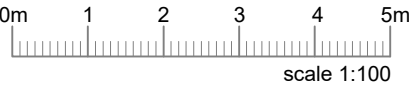
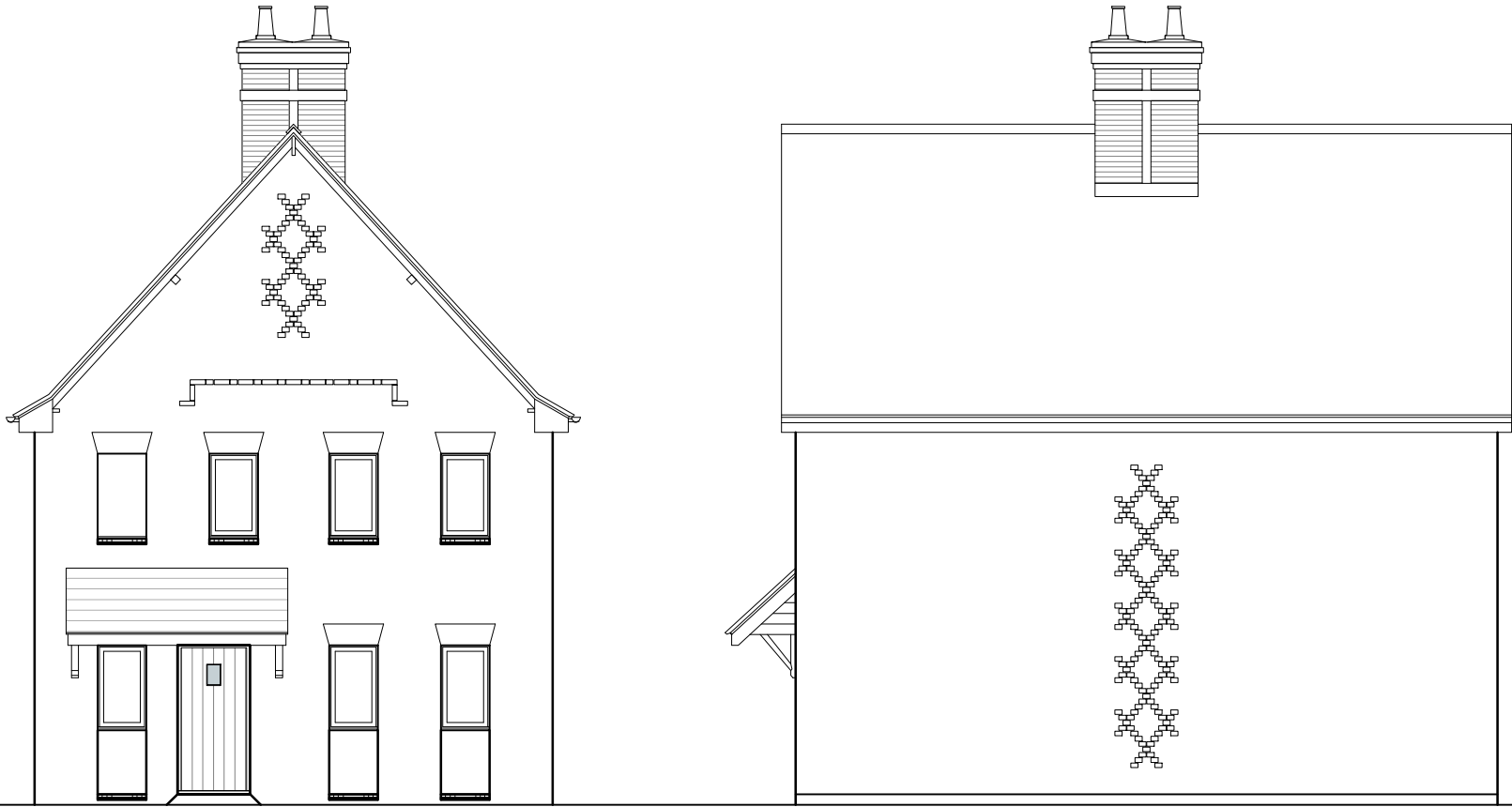
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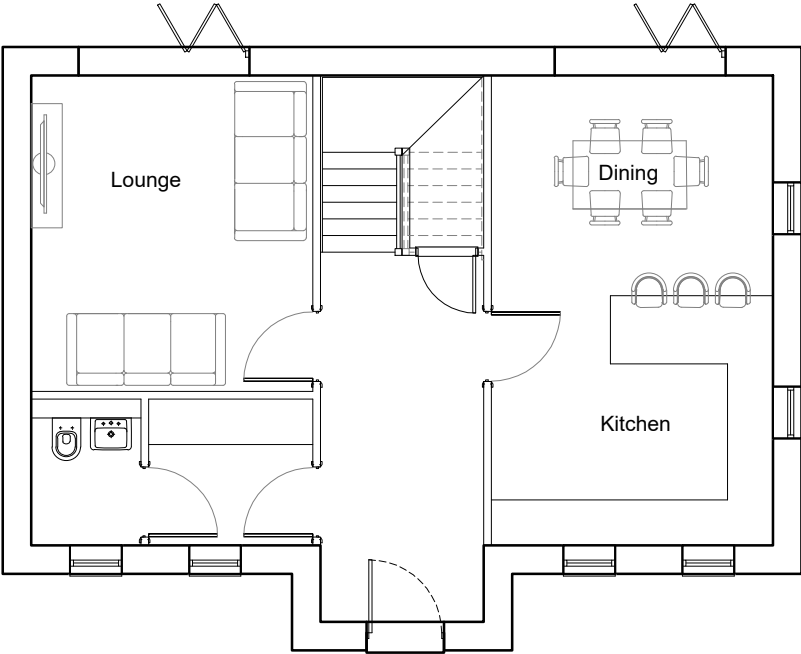
FIRST FLOOR PLAN



REVISIONS / AUTHOR		DATE
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PROJECT		
LAND OFF BARKHAM ROAD		
BARKHAM		
TITLE		
FLOOR PLANS		
HOUSE TYPE D		
DRAWING NUMBER		REV
PL016		-
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Bucks		
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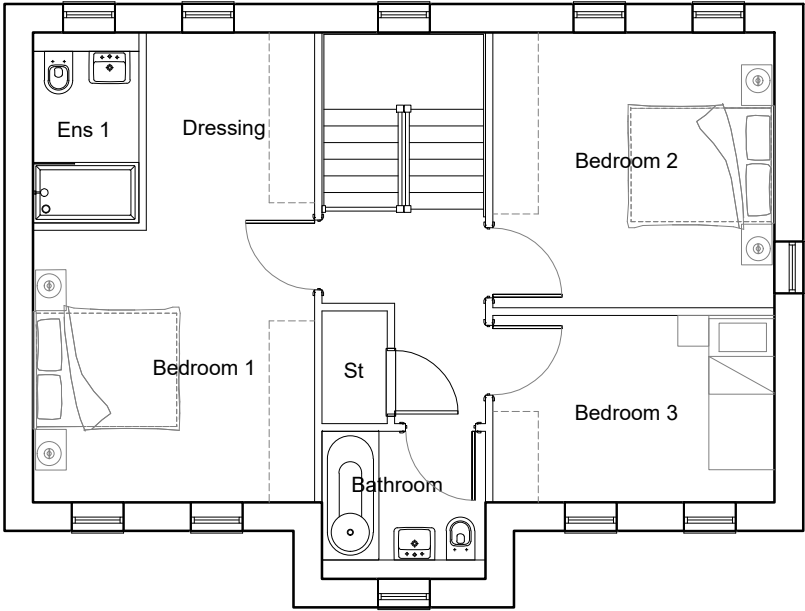


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PROJECT			
LAND OFF BARKHAM ROAD			
BARKHAM			
TITLE			
ELEVATIONS			
HOUSE TYPE D			
DRAWING NUMBER			REV
PL017			-
ABBEYMILL HOMES LTD.			
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Olney			
Bucks			
MK46 4AL			
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GROUND FLOOR PLAN

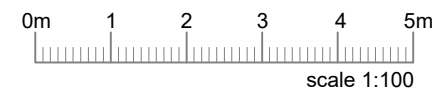
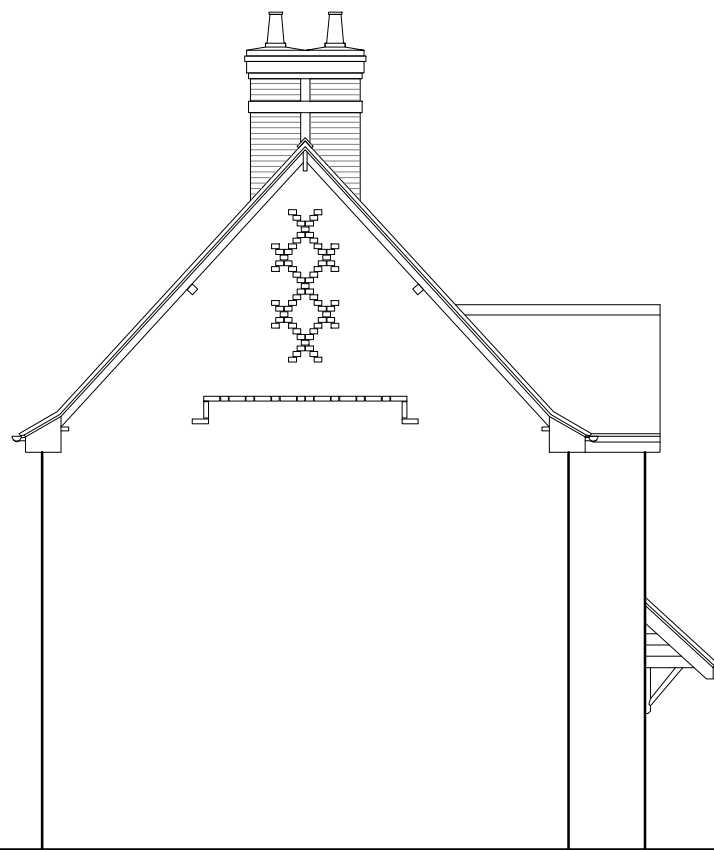
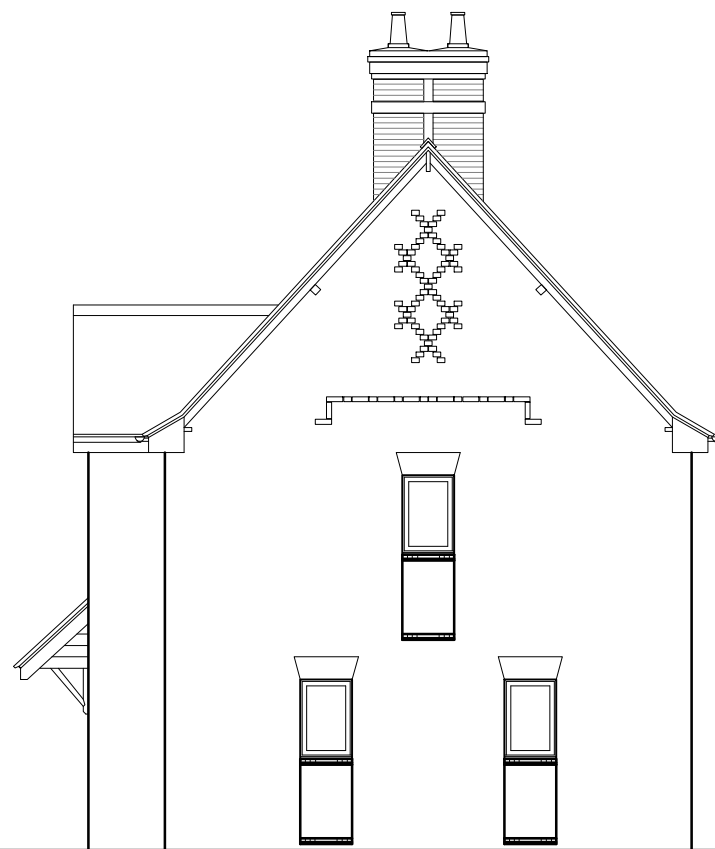
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FIRST FLOOR PLAN



REVISIONS / AUTHOR		DATE
PURPOSE OF ISSUE		
PLANNING		
DRAWN MW		SCALE 1:100@A3
CHECKED TN	SIGNED OFF TN	DATE JAN 2025
PROJECT LAND OFF BARKHAM ROAD BARKHAM		
TITLE FLOOR PLANS HOUSE TYPE E		
DRAWING NUMBER		REV
PL018		-
ABBEYMILL HOMES LTD.		
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PLANNING		
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MW		1:100@A3
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PROJECT		
LAND OFF BARKHAM ROAD		
BARKHAM		
TITLE		
ELEVATIONS		
HOUSE TYPE E		
DRAWING NUMBER		REV
PL019		-
ABBEMILL HOMES LTD.		
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Bucks		
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Build Standards

Ashby Energy Assessors Ltd

T: 01476 870504

E: info@ashbyenergy.co.uk

W: ashbyenergy.co.uk

Coppid Hill House

RG42 4BS

Project Reference Number: ABBE 7531 / 7538

Client: Matthew Whatley of Abbeymill Homes

Date: 21/01/2025

Revision	Date	Changes	Prepared By
V1	21/01/2025	Draft report for review	James Rivers

1.0. Analysis

The simulation has been carried out using site plan, floor plans and elevations provided. The plans / elevations used in this assessment are listed in the Table 2 below.

Table 2 Architectural drawings numbers

Drawing Number	Title	Date
WOK-PL006 - Apartments - Ground Floor Plan	Ground Floor Plan Apartments	01/01/2025
WOK-PL007 - Apartments - First Floor Plan	First Floor Plan Apartments	01/01/2025
WOK-PL008 - Apartments - Elevations	Apartments Elevations	01/01/2025
WOK-PL009 - Apartments - Elevations	Apartments Elevations	01/01/2025
WOK-PL010 - House Type A - Floor Plans	House Type A Plans	01/01/2025
WOK-PL011 - House Type A - Elevations	House Type A Elevations	01/01/2025
WOK-PL012 - House Type B - Floor Plans	House Type B Plans	01/01/2025
WOK-PL013 - House Type B - Elevations	House Type B Elevations	01/01/2025
WOK-PL014 - House Type C - Floor Plans	House Type C Plans	01/01/2025
WOK-PL015 - House Type C - Elevations	House Type C Elevations	01/01/2025
WOK-PL016 - House Type D - Floor Plans	House Type D Plans	01/01/2025
WOK-PL017 - House Type D - Elevations	House Type D Elevations	01/01/2025
WOK-PL018 - House Type E - Floor Plans	House Type E Plans	01/01/2025
WOK-PL019 - House Type E - Elevations	House Type E Elevations	01/01/2025
WOK-SK002-P1 - Initial Sketch Layout - Option 2	Site Sketch	01/01/2025

2.0. Construction Specification

Construction	U-Value (W/m ² K)	Notes:
Floors		
Ground Floor B&B	0.11	-To be agreed – Expected to be (Concrete B&B Deck, 150mm Kooltherm K103, 75mm)
Walls		
Cavity Wall	0.19	-To be agreed – Expected to be (102.5mm facing brick, 150mm DriTherm Cavity Slab 32, 100mm medium block, 12.5mm plasterboard on dabs) Can the medium block to turned into a aircrete block?
Party Wall	0.00	-To be agreed
Roofs		
Roof Insulated at Joists	0.11	-To be agreed – Expected to be - 400mm Knauf Loft Roll 44
Openings		
Windows		U Value: 1.20 W/m ² K Frame factor: 0.70 G-value: 0.50 (glazing) Source: Manufacturer data/BFRC
Doors		U Value: 1.20 W/m ² K

3.0. Thermal Bridging

Ref.	Source	Comments
E2 Other lintels (Thermally Broken)	RCD	Recognised Construction Details Used
E3 Sill	RCD	Recognised Construction Details Used
E4 Jamb	RCD	Recognised Construction Details Used
E5 Ground Floor	RCD	Recognised Construction Details Used
E6 Intermediate floor within a building	RCD	Recognised Construction Details Used
E7 Intermediate floor between dwellings (flats)	RCD	Recognised Construction Details Used
E10 Eaves (Insulation at ceiling level)	RCD	Recognised Construction Details Used
E12 Gable (Insulation at ceiling level)	RCD	Recognised Construction Details Used
E16 Corner (Normal)	RCD	Recognised Construction Details Used
E17 Corner (inverted)	RCD	Recognised Construction Details Used
P1 Party Wall – Ground Floor	RCD	Recognised Construction Details Used
P2 Party Wall – Intermediate floor within a dwelling	RCD	Recognised Construction Details Used
P4 Party Wall – Roof (insulation at ceiling level)	RCD	Recognised Construction Details Used

A thermal bridging pack has been included with your email attachment which details the requirements for each junction, these documents also as the checklists which will need to be signed and returned upon completion of the build.

5.0. Building Services

Main Heating System	
Heating Type	Air Source Heat Pump - MCS Approved
Fuel	Electricity
Make & Model	Vaillant
Efficiency	TBC
Auxiliary Pump Location	In heated space
Flow Temperature	45°C
Emitters	Underfloor
Heating Controls	Time and temperature zone control
Boiler Interlock	No
Delayed Start Thermostat	No
Weather Compensator	No
Flue Gas Heat Recovery	No
Cylinder	
Litres	150
Heat loss	1.50kWh/day
Heat Exchange Area	TBC
Water Heating	
Cold water source	From mains
Hot water source	From heat pump
Waste Water Heat Recovery	None
Number of baths	1 – Subject to plot
Flow Rate of shower	11 litres/min
Insulated Hot Water Pipes	Fully Insulated
Cylinder in Heated Space	Yes
Cylinder Thermostat	Yes
Independent Time Control	Yes
Secondary Heating	
Heating Type	None
Ventilation	
Type	System 1 – Intermittent extract fans
Air Test Score	4.0
Extracts	2-5 Subject to plot
Open Flues	0
Passive Vents	0
Mechanical Ventilation	No
Other	
Thermal Mass	Subject to plot
Renewables	None

Lighting	120 lm/W, Quantity: Subject to plot
Summer Overheating	
A summer overheating assessment has not been performed.	



Full SAP Calculation Printout



Property Reference	House Type E			Issued on Date	29/01/2025
Assessment Reference	Be Green Act	Prop Type Ref			
Property					
SAP Rating	80 C	DER	4.24	TER	9.96
Environmental	96 A	% DER < TER			57.43
CO ₂ Emissions (t/year)	0.49	DFEE	39.80	TFEE	40.45
Compliance Check	See BREL	% DFEE < TFEE			1.59
% DPER < TPER	14.61	DPER	44.39	TPER	51.99
Assessor Details	Mr. James Rivers			Assessor ID	R423-0001
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)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220 (5)

2. Ventilation rate

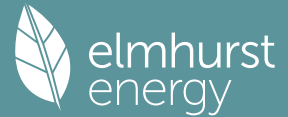
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3241 (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) = 0.2755 (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	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237 (22b)
Effective ac	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524 (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
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511		(27)
Door 1.2			2.2200	1.2000	2.6640		(26)
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000 (28a)
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000 (29a)
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800 (30)
Total net area of external elements Aum(A, m ²)			300.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.8490		(33)
GF			87.5000			75.0000	6562.5000 (32c)
FF			113.6700			9.0000	1023.0300 (32c)
Internal Floor 1			63.2200			18.0000	1137.9600 (32d)
Internal Ceiling 1			63.2200			9.0000	568.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26367.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.5349 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.6200	0.0260	0.4581	
E3 Sill				7.7300	0.0230	0.1778	
E4 Jamb				84.7200	0.0180	1.5250	

Full SAP Calculation Printout



E5 Ground floor (normal)	34.1000	0.0680	2.3188
E6 Intermediate floor within a dwelling	34.1000	0.0010	0.0341
E16 Corner (normal)	30.6000	0.0400	1.2240
E17 Corner (inverted - internal area greater than external area)	10.2000	0.0320	0.3264
E10 Eaves (insulation at ceiling level)	19.5000	0.0550	1.0725
E12 Gable (insulation at ceiling level)	14.6000	0.0370	0.5402
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.6769 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	90.5259 (37)

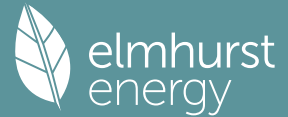
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	59.7614	59.5066	59.2568	58.0837	57.8643	56.8425	56.8425	56.6533	57.2361	57.8643	58.3083	58.7725 (38)
Average = Sum(39)m / 12 =	150.2873	150.0325	149.7828	148.6097	148.3902	147.3684	147.3684	147.1792	147.7620	148.3902	148.8342	149.2984 (39)
												148.6086
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1886	1.1866	1.1846	1.1753	1.1736	1.1655	1.1655	1.1640	1.1686	1.1736	1.1771	1.1808 (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												2.8851 (42)
Hot water usage for mixer showers												
	99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342 (42a)
Hot water usage for baths												
	31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350 (42b)
Hot water usage for other uses												
	44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766 (42c)
Average daily hot water use (litres/day)												161.2461 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458 (44)
Energy conte	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662 (45)
Energy content (annual)										Total = Sum(45)m =		2678.3144
Distribution loss (46)m = 0.15 x (45)m												
	41.6530	36.6881	38.5734	32.9199	31.2423	27.4206	26.5169	27.9704	28.7230	32.9066	36.0680	41.0649 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss												
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage												
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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												
	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386 (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	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386 (64)
12Total per year (kWh/year)												3247.8604 (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												
	131.0287	116.2782	124.2023	110.4221	107.9517	98.2320	97.4770	100.6989	101.1190	111.6409	117.4003	129.7252 (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	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.9748	163.8292	147.9748	152.9073	147.9748	152.9073	147.9748	147.9748	152.9073	147.9748	152.9073	147.9748 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	293.3766	296.4209	288.7493	272.4173	251.8012	232.4249	219.4803	216.4360	224.1076	240.4396	261.0557	280.4320 (68)
Pumps, fans	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)
Total internal gains	176.1138	173.0330	166.9386	153.3641	145.0964	136.4333	131.0174	135.3480	140.4430	150.0550	163.0560	174.3618 (72)
	683.7421	699.5600	669.9396	644.9656	611.1493	588.0424	564.7494	566.0357	583.7348	604.7463	643.2959	669.0455 (73)

6. Solar gains												
[Jan]												
			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		W/m2		Specific data		factor	W
									or Table 6c		Table 6d	
North			12.7900		10.6334		0.5000		0.7000		0.7700	32.9871 (74)
South			17.7400		46.7521		0.5000		0.7000		0.7700	201.1665 (78)
West			4.7100		19.6403		0.5000		0.7000		0.7700	22.4372 (80)
Solar gains	256.5908	436.3909	599.0764	751.8051	855.2540	856.0584	822.3349	743.2976	651.2597	482.4748	307.1213	219.7773 (83)
Total gains	940.3329	1135.9509	1269.0160	1396.7707	1466.4033	1444.1008	1387.0843	1309.3333	1234.9945	1087.2210	950.4172	888.8228 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.7347	48.8175	48.8989	49.2849	49.3578	49.7000	49.7000	49.7639	49.5676	49.3578	49.2105	49.0575
alpha	4.2490	4.2545	4.2599	4.2857	4.2905	4.3133	4.3133	4.3176	4.3045	4.2905	4.2807	4.2705
util living area	0.9903	0.9782	0.9552	0.8974	0.7856	0.6129	0.4579	0.5022	0.7267	0.9220	0.9803	0.9923 (86)
Living	19.7813	19.9801	20.2302	20.5314	20.7619	20.8859	20.9187	20.9141	20.8392	20.5341	20.1004	19.7451
Non living	18.5129	18.7654	19.0793	19.4496	19.7077	19.8301	19.8523	19.8514	19.7917	19.4626	18.9259	18.4717
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	20.3766	19.9801	20.2302	20.5314	20.7619	20.8859	20.9187	20.9141	20.8392	20.5341	20.1004	19.9207 (87)
Th 2	19.9291	19.9307	19.9323	19.9398	19.9412	19.9477	19.9477	19.9489	19.9452	19.9412	19.9384	19.9354 (88)
util rest of house	0.9876	0.9724	0.9431	0.8698	0.7310	0.5268	0.3530	0.3944	0.6463	0.8949	0.9741	0.9901 (89)
MIT 2	19.3645	18.7654	19.0793	19.4496	19.7077	19.8301	19.8523	19.8514	19.7917	19.4626	18.9259	18.7355 (90)
Living area fraction									fLA = Living area / (4) =			0.1236 (91)
MIT	19.4896	18.9155	19.2216	19.5833	19.8380	19.9606	19.9841	19.9828	19.9212	19.5951	19.0711	18.8820 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4896	18.9155	19.2216	19.5833	19.8380	19.9606	19.9841	19.9828	19.9212	19.5951	19.0711	18.8820 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9863	0.9652	0.9330	0.8588	0.7251	0.5279	0.3567	0.3980	0.6443	0.8838	0.9671	0.9873 (94)
Useful gains	927.4441	1096.3652	1183.9659	1199.5925	1063.3024	762.3400	494.8179	521.0555	795.6600	960.9372	919.1893	877.5358 (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	2282.8090	2102.7879	1905.4753	1587.6434	1207.6032	789.9878	498.7085	527.3119	860.1534	1334.7785	1781.7129	2191.9973 (97)
Space heating kWh	1008.3915	676.3160	536.8030	279.3966	107.3598	0.0000	0.0000	0.0000	0.0000	278.1380	621.0170	977.9594 (98a)
Space heating requirement - total per year (kWh/year)												4485.3812
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	1008.3915	676.3160	536.8030	279.3966	107.3598	0.0000	0.0000	0.0000	0.0000	278.1380	621.0170	977.9594 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4485.3812
Space heating per m2										(98c) / (4) =		35.4744 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												290.6420 (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	1008.3915	676.3160	536.8030	279.3966	107.3598	0.0000	0.0000	0.0000	0.0000	278.1380	621.0170	977.9594 (98)
Space heating efficiency (main heating system 1)	290.6420	290.6420	290.6420	290.6420	290.6420	0.0000	0.0000	0.0000	0.0000	290.6420	290.6420	290.6420 (210)
Space heating fuel (main heating system)	346.9531	232.6973	184.6956	96.1308	36.9388	0.0000	0.0000	0.0000	0.0000	95.6978	213.6708	336.4825 (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	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386 (64)
Efficiency of water heater	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031 (216)
Fuel for water heating, kWh/month	187.4946	165.7695	175.6890	153.1188	147.5848	132.0369	129.4695	135.0416	137.0297	153.9650	165.1870	185.2403 (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	27.1851	21.8089	19.6365	14.3865	11.1126	9.0791	10.1373	13.1768	17.1154	22.4563	25.3643	27.9407 (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												1543.2666 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												173.9031
Water heating fuel used												1867.6268 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)

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Electricity for lighting (calculated in Appendix L)	219.3993	(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	3630.2928	(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	1543.2666	0.1560	240.7918	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1867.6268	0.1411	263.4768	(264)
Space and water heating			504.2686	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	219.3993	0.1443	31.6661	(268)
Total CO2, kg/year			535.9347	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1543.2666	1.5776	2434.6629	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1867.6268	1.5217	2841.8852	(278)
Space and water heating			5276.5481	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	219.3993	1.5338	336.5219	(282)
Total Primary energy kWh/year			5613.0701	(286)
Dwelling Primary energy Rate (DPER)			44.3900	(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)	
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280	(1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220	(5)

2. Ventilation rate

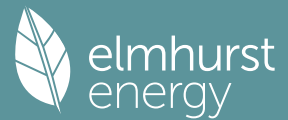
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1241 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3741	(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) =	0.3180 (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	0.4054	0.3974	0.3895	0.3497	0.3418	0.3021	0.3021	0.2941	0.3180	0.3418	0.3577	0.3736	(22b)
Effective ac	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5640	0.5698	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.2200	1.0000	2.2200			(26)
TER Opening Type (Uw = 1.20)			29.4000	1.1450	33.6641			(27)
Heat Loss Floor 1			63.2200	0.1300	8.2186			(28a)
Cavity Wall	173.9100	31.6200	142.2900	0.1800	25.6122			(29a)
Joist	63.2200		63.2200	0.1100	6.9542			(30)
Total net area of external elements Aum(A, m2)			300.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	76.6691			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5349 (35)

List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				17.6200	0.0500	0.8810		
E3 Sill				7.7300	0.0500	0.3865		
E4 Jamb				84.7200	0.0500	4.2360		
E5 Ground floor (normal)				34.1000	0.1600	5.4560		
E6 Intermediate floor within a dwelling				34.1000	0.0000	0.0000		
E16 Corner (normal)				30.6000	0.0900	2.7540		
E17 Corner (inverted - internal area greater than external area)				10.2000	-0.0900	-0.9180		
E10 Eaves (insulation at ceiling level)				19.5000	0.0600	1.1700		
E12 Gable (insulation at ceiling level)				14.6000	0.0600	0.8760		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8415	(36)
Point Thermal bridges							0.0000	(36a)
Total fabric heat loss						(33) + (36) + (36a) =	91.5106	(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	61.9425	61.6030	61.2702	59.7072	59.4147	58.0534	58.0534	57.8013	58.5778	59.4147	60.0063	60.6248	(38)
Average = Sum(39)m / 12 =	153.4531	153.1136	152.7808	151.2178	150.9254	149.5640	149.5640	149.3119	150.0884	150.9254	151.5170	152.1354	(39)
												151.2164	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2136	1.2110	1.2083	1.1960	1.1937	1.1829	1.1829	1.1809	1.1870	1.1937	1.1983	1.2032	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

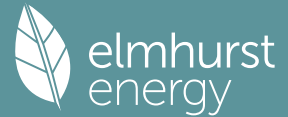
Assumed occupancy													2.8851	(42)
Hot water usage for mixer showers														
72.5939	71.5030	69.9132	66.8716	64.6269	62.1237	60.7009	62.2786	64.0080	66.6957	69.8027	72.3158	(42a)		
Hot water usage for baths														
31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	(42b)		
Hot water usage for other uses														
44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	(42c)		
Average daily hot water use (litres/day)													136.1477	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	148.1114	144.9486	141.0970	135.2404	130.4844	125.3713	123.4064	127.2414	131.2860	136.6538	142.6007	147.7273	(44)	
Energy content (annual)	234.5723	206.4049	216.8609	185.1373	175.6570	154.1586	149.2494	157.5515	161.8887	185.4379	203.1608	231.3053	(45)	
Distribution loss (46)m = 0.15 x (45)m														
35.1858	30.9607	32.5291	27.7706	26.3486	23.1238	22.3874	23.6327	24.2833	27.8157	30.4741	34.6958	(46)		
Water storage loss:														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.7527	(55)
Total storage loss														
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)	
If cylinder contains dedicated solar storage														
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														
281.1672	248.4906	263.4558	230.2292	222.2519	199.2505	195.8443	204.1464	206.9806	232.0328	248.2526	277.9002	(62)		
WWHRS	-33.1869	-29.3508	-30.7344	-25.4493	-23.7179	-20.2955	-19.0238	-20.2299	-20.9985	-24.7550	-28.0444	-32.5723	(63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	247.9803	219.1399	232.7213	204.7799	198.5341	178.9549	176.8205	183.9164	185.9820	207.2779	220.2082	245.3279	(64)	
12Total per year (kWh/year)													2501.6433	(64)
Electric shower(s)													2502	(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														
115.2712	102.2982	109.3822	97.6316	95.6819	87.3312	86.9013	89.6618	89.9015	98.9340	103.6244	114.1849	(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	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.9748	163.8292	147.9748	152.9073	147.9748	152.9073	147.9748	147.9748	152.9073	147.9748	152.9073	147.9748	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.3766	296.4209	288.7493	272.4173	251.8012	232.4249	219.4803	216.4360	224.1076	240.4396	261.0557	280.4320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	(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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	(71)
Water heating gains (Table 5)	154.9344	152.2295	147.0190	135.5995	128.6047	121.2933	116.8029	120.5131	124.8632	132.9759	143.9228	153.4744	(72)
Total internal gains	665.5627	681.7565	653.0200	630.2010	597.6575	572.9024	550.5349	551.2008	568.1549	590.6671	627.1627	651.1581	(73)

6. Solar gains

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[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					10.6700	10.6334	0.6300	0.7000			0.7700	34.6743 (74)
South					14.8000	46.7521	0.6300	0.7000			0.7700	211.4630 (78)
West					3.9300	19.6403	0.6300	0.7000			0.7700	23.5891 (80)
Solar gains	269.7264	458.7316	629.7468	790.2956	899.0410	899.8865	864.4365	781.3527	684.6021	507.1751	322.8438	231.0282 (83)
Total gains	935.2891	1140.4881	1282.7668	1420.4967	1496.6986	1472.7889	1414.9714	1332.5535	1252.7570	1097.8422	950.0066	882.1864 (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	47.7293	47.8351	47.9393	48.4348	48.5287	48.9704	48.9704	49.0531	48.7993	48.5287	48.3392	48.1427
alpha	4.1820	4.1890	4.1960	4.2290	4.2352	4.2647	4.2647	4.2702	4.2533	4.2352	4.2226	4.2095
util living area												
	0.9906	0.9783	0.9548	0.8955	0.7822	0.6095	0.4554	0.5002	0.7258	0.9218	0.9807	0.9925 (86)
MIT	19.4245	19.7000	20.0452	20.4611	20.7748	20.9423	20.9867	20.9804	20.8776	20.4609	19.8655	19.3786 (87)
Th 2	19.9091	19.9112	19.9133	19.9232	19.9251	19.9337	19.9337	19.9353	19.9304	19.9251	19.9213	19.9174 (88)
util rest of house												
	0.9880	0.9725	0.9426	0.8674	0.7268	0.5227	0.3497	0.3915	0.6445	0.8944	0.9745	0.9905 (89)
MIT 2	18.0913	18.4410	18.8741	19.3841	19.7345	19.8991	19.9290	19.9277	19.8464	19.3972	18.6609	18.0385 (90)
Living area fraction												0.1236 (91)
MIT	18.2561	18.5966	19.0188	19.5172	19.8631	20.0280	20.0598	20.0578	19.9739	19.5287	18.8098	18.2041 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2561	18.5966	19.0188	19.5172	19.8631	20.0280	20.0598	20.0578	19.9739	19.5287	18.8098	18.2041 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9821	0.9629	0.9295	0.8548	0.7232	0.5308	0.3625	0.4044	0.6482	0.8818	0.9654	0.9855 (94)
Useful gains	918.5781	1098.1349	1192.3891	1214.2107	1082.4762	781.8024	512.9337	538.9389	812.0053	968.0541	917.1823	869.4252 (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	2141.6037	2097.1371	1912.6392	1605.5083	1232.0201	811.8387	517.4544	546.1513	881.5975	1347.5672	1774.2325	2130.5266 (97)
Space heating kWh	909.9311	671.3295	535.8661	281.7342	111.2606	0.0000	0.0000	0.0000	0.0000	282.3578	617.0761	938.2594 (98a)
Space heating requirement - total per year (kWh/year)												4347.8149
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	909.9311	671.3295	535.8661	281.7342	111.2606	0.0000	0.0000	0.0000	0.0000	282.3578	617.0761	938.2594 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4347.8149
Space heating per m2	(98c) / (4) =											34.3864 (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	909.9311	671.3295	535.8661	281.7342	111.2606	0.0000	0.0000	0.0000	0.0000	282.3578	617.0761	938.2594 (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)	985.8408	727.3342	580.5700	305.2375	120.5424	0.0000	0.0000	0.0000	0.0000	305.9131	668.5549	1016.5324 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	247.9803	219.1399	232.7213	204.7799	198.5341	178.9549	176.8205	183.9164	185.9820	207.2779	220.2082	245.3279 (64)
Efficiency of water heater (217)m	86.7057	86.4019	85.8677	84.7756	82.8144	79.8000	79.8000	79.8000	79.8000	84.7535	86.2419	79.8000 (216)
Fuel for water heating, kWh/month	286.0022	253.6285	271.0232	241.5552	239.7337	224.2543	221.5795	230.4717	233.0602	244.5655	255.3379	282.7285 (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	30.7462	24.6658	22.2088	16.2711	12.5683	10.2684	11.4652	14.9029	19.3574	25.3980	28.6869	31.6008 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-56.2824	-77.9276	-110.0134	-121.3748	-128.8941	-119.5150	-117.9236	-112.2104	-101.9552	-87.8848	-61.3218	-48.8180 (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)	-36.2841	-75.7631	-149.5926	-223.3025	-294.0063	-295.0396	-291.6718	-247.6239	-182.3189	-108.0136	-48.3243	-28.7454 (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)

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Annual totals kWh/year	
Space heating fuel - main system 1	4710.5253 (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	2983.9404 (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)	248.1398 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3124.8069 (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	4903.7986 (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	4710.5253	0.2100	989.2103 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2983.9404	0.2100	626.6275 (264)
Space and water heating			1615.8378 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	248.1398	0.1443	35.8142 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1144.1210	0.1350	-154.4518
PV Unit electricity exported	-1980.6859	0.1261	-249.7051
Total			-404.1569 (269)
Total CO2, kg/year			1259.4244 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9600 (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	4710.5253	1.1300	5322.8936 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2983.9404	1.1300	3371.8526 (278)
Space and water heating			8694.7462 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	248.1398	1.5338	380.6051 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1144.1210	1.4989	-1714.9748
PV Unit electricity exported	-1980.6859	0.4628	-916.6038
Total			-2631.5786 (283)
Total Primary energy kWh/year			6573.8735 (286)
Target Primary Energy Rate (TPER)			51.9900 (287)

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

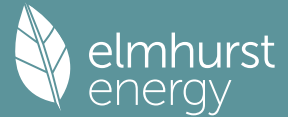
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 322.4220 (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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3241 (18)

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Number of sides sheltered

2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.2755 \quad (21)$$

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	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524	(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	
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511			(27)
Door 1.2			2.2200	1.2000	2.6640			(26)
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000	(28a)
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000	(29a)
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800	(30)
Total net area of external elements Aum(A, m2)			300.3500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	82.8490		(33)
GF			87.5000			75.0000	6562.5000	(32c)
FF			113.6700			9.0000	1023.0300	(32c)
Internal Floor 1			63.2200			18.0000	1137.9600	(32d)
Internal Ceiling 1			63.2200			9.0000	568.9800	(32e)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 26367.1500 \quad (34)$$

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

$$208.5349 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.6200	0.0260	0.4581
E3 Sill	7.7300	0.0230	0.1778
E4 Jamb	84.7200	0.0180	1.5250
E5 Ground floor (normal)	34.1000	0.0680	2.3188
E6 Intermediate floor within a dwelling	34.1000	0.0010	0.0341
E16 Corner (normal)	30.6000	0.0400	1.2240
E17 Corner (inverted - internal area greater than external area)	10.2000	0.0320	0.3264
E10 Eaves (insulation at ceiling level)	19.5000	0.0550	1.0725
E12 Gable (insulation at ceiling level)	14.6000	0.0370	0.5402

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

$$7.6769 \quad (36)$$

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 90.5259 \quad (37)$$

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

(38)m	Jan 59.7614	Feb 59.5066	Mar 59.2568	Apr 58.0837	May 57.8643	Jun 56.8425	Jul 56.8425	Aug 56.6533	Sep 57.2361	Oct 57.8643	Nov 58.3083	Dec 58.7725	(38)
Heat transfer coeff	150.2873	150.0325	149.7828	148.6097	148.3902	147.3684	147.3684	147.1792	147.7620	148.3902	148.8342	149.2984	(39)
Average = Sum(39)m / 12 =												148.6086	(39)

HLP	Jan 1.1886	Feb 1.1866	Mar 1.1846	Apr 1.1753	May 1.1736	Jun 1.1655	Jul 1.1655	Aug 1.1640	Sep 1.1686	Oct 1.1736	Nov 1.1771	Dec 1.1808	(40)
HLP (average)												1.1753	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8851 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													(42b)
31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	31.2350	(42b)
Hot water usage for other uses													(42c)
44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	44.1766	(42c)
Average daily hot water use (litres/day)												69.2185	(43)
Daily hot water use	Jan 75.5175	Feb 73.4457	Mar 71.1838	Apr 68.3688	May 65.8574	Jun 63.2476	Jul 62.7056	Aug 64.9629	Sep 67.2780	Oct 69.9581	Nov 72.7980	Dec 75.4116	(44)
Energy conte	119.6013	104.5856	109.4068	93.5935	88.6568	77.7703	75.8369	80.4376	82.9605	94.9325	103.7140	118.0763	(45)
Energy content (annual)										Total = Sum(45)m =		1149.5721	(45)
Distribution loss (46)m = 0.15 x (45)m	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)
Water storage loss:													(46)
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	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	101.6611	88.8978	92.9958	79.5545	75.3583	66.1047	64.4614	68.3719	70.5164	80.6926	88.1569	100.3649	(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	101.6611	88.8978	92.9958	79.5545	75.3583	66.1047	64.4614	68.3719	70.5164	80.6926	88.1569	100.3649	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		977.1363	(64)
Electric shower(s)	58.1356	51.7993	56.5629	53.9772	54.9901	52.4552	54.2037	54.9901	53.9772	56.5629	55.4993	58.1356	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												661.2892	(64a)
Heat gains from water heating, kWh/month	39.9492	35.1743	37.3897	33.3829	32.5871	29.6400	29.6663	30.8405	31.1234	34.3139	35.9141	39.6251	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.9748	163.8292	147.9748	152.9073	147.9748	152.9073	147.9748	147.9748	152.9073	147.9748	152.9073	147.9748 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.3766	296.4209	288.7493	272.4173	251.8012	232.4249	219.4803	216.4360	224.1076	240.4396	261.0557	280.4320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256 (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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)
Water heating gains (Table 5)	53.6951	52.3427	50.2549	46.3652	43.7999	41.1667	39.8740	41.4523	43.2270	46.1208	49.8806	53.2596 (72)
Total internal gains	561.3234	578.8697	553.2559	537.9667	509.8527	492.7757	473.6060	472.1400	486.5187	500.8120	530.1205	547.9433 (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					12.7900	10.6334		0.5000	0.7000	0.7700		32.9871 (74)
South					17.7400	46.7521		0.5000	0.7000	0.7700		201.1665 (78)
West					4.7100	19.6403		0.5000	0.7000	0.7700		22.4372 (80)
Solar gains	256.5908	436.3909	599.0764	751.8051	855.2540	856.0584	822.3349	743.2976	651.2597	482.4748	307.1213	219.7773 (83)
Total gains	817.9142	1015.2606	1152.3323	1289.7718	1365.1067	1348.8341	1295.9410	1215.4376	1137.7784	983.2868	837.2419	767.7206 (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	Dec
tau	48.7347	48.8175	48.8989	49.2849	49.3578	49.7000	49.7000	49.7639	49.5676	49.3578	49.2105	49.0575
alpha	4.2490	4.2545	4.2599	4.2857	4.2905	4.3133	4.3133	4.3176	4.3045	4.2905	4.2807	4.2705
util living area	0.9942	0.9853	0.9673	0.9177	0.8154	0.6464	0.4874	0.5364	0.7645	0.9422	0.9875	0.9956 (86)
MIT	19.3578	19.6297	19.9759	20.4036	20.7408	20.9307	20.9837	20.9756	20.8545	20.4011	19.7950	19.3093 (87)
Th 2	19.9291	19.9307	19.9323	19.9398	19.9412	19.9477	19.9477	19.9489	19.9452	19.9412	19.9384	19.9354 (88)
util rest of house	0.9926	0.9813	0.9580	0.8940	0.7639	0.5589	0.3770	0.4233	0.6864	0.9205	0.9834	0.9943 (89)
MIT 2	18.4414	18.7118	19.0527	19.4666	19.7663	19.9144	19.9430	19.9412	19.8648	19.4741	18.8832	18.3979 (90)
Living area fraction	18.5547	18.8252	19.1668	19.5824	19.8868	20.0400	20.0717	20.0691	19.9871	19.5887	18.9959	18.5105 (92)
Temperature adjustment	18.5547	18.8252	19.1668	19.5824	19.8868	20.0400	20.0717	20.0691	19.9871	19.5887	18.9959	18.5105 (93)
adjusted MIT	18.5547	18.8252	19.1668	19.5824	19.8868	20.0400	20.0717	20.0691	19.9871	19.5887	18.9959	18.5105 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9896	0.9756	0.9494	0.8844	0.7609	0.5671	0.3904	0.4368	0.6899	0.9113	0.9782	0.9919 (94)
Useful gains	809.4065	990.4815	1094.0135	1140.7303	1038.7425	764.8908	505.9551	530.8561	784.9585	896.0546	819.0087	761.4754 (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	2142.3040	2089.2394	1897.2724	1587.5118	1214.8360	801.6871	511.6167	540.0162	869.8958	1333.8336	1770.5237	2136.5399 (97)
Space heating kWh	991.6757	738.3653	597.6246	321.6827	131.0136	0.0000	0.0000	0.0000	0.0000	325.7076	685.0908	1023.0479 (98a)
Space heating requirement - total per year (kWh/year)												4814.2082
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	991.6757	738.3653	597.6246	321.6827	131.0136	0.0000	0.0000	0.0000	0.0000	325.7076	685.0908	1023.0479 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4814.2082
Space heating per m ²										(98c) / (4) =		38.0750 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1385.2634	1090.5265	1118.5622	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8461	0.9080	0.8828	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1172.1022	990.1579	987.5193	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1514.5028	1455.5156	1364.3635	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	246.5284	346.2262	280.3721	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.6321	86.5565	70.0930	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												218.2817 (107)
Energy for space heating												38.0750 (99)
Energy for space cooling												1.7264 (108)
Total												39.8014 (109)
Fabric Energy Efficiency (DFEE)												39.8 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	40.0000 / (5) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (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) = 0.3180 (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	0.4054	0.3974	0.3895	0.3497	0.3418	0.3021	0.3021	0.2941	0.3180	0.3418	0.3577	0.3736 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5640	0.5698 (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
TER Opaque door			2.2200	1.0000	2.2200		(26)
TER Opening Type (Uw = 1.20)			29.4000	1.1450	33.6641		(27)
Heat Loss Floor 1			63.2200	0.1300	8.2186		(28a)
Cavity Wall	173.9100	31.6200	142.2900	0.1800	25.6122		(29a)
Joist	63.2200		63.2200	0.1100	6.9542		(30)
Total net area of external elements Aum(A, m ²)			300.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	76.6691		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 208.5349 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.6200	0.0500	0.8810
E3 Sill	7.7300	0.0500	0.3865
E4 Jamb	84.7200	0.0500	4.2360
E5 Ground floor (normal)	34.1000	0.1600	5.4560
E6 Intermediate floor within a dwelling	34.1000	0.0000	0.0000
E16 Corner (normal)	30.6000	0.0900	2.7540
E17 Corner (inverted - internal area greater than external area)	10.2000	-0.0900	-0.9180
E10 Eaves (insulation at ceiling level)	19.5000	0.0600	1.1700
E12 Gable (insulation at ceiling level)	14.6000	0.0600	0.8760

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.8415 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 91.5106 (37)

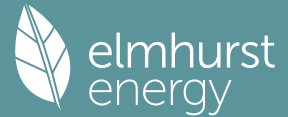
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	61.9425	61.6030	61.2702	59.7072	59.4147	58.0534	58.0534	57.8013	58.5778	59.4147	60.0063	60.6248 (38)
Average = Sum(39)m / 12 =	153.4531	153.1136	152.7808	151.2178	150.9254	149.5640	149.5640	149.3119	150.0884	150.9254	151.5170	152.1354 (39)
												151.2164

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2136	1.2110	1.2083	1.1960	1.1937	1.1829	1.1829	1.1809	1.1870	1.1937	1.1983	1.2032 (40)
HLP (average)												1.1960
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8851 (42)
Hot water usage for mixer showers	

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Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for other uses	31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350 (42b)
Average daily hot water use (litres/day)	44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766 (42c)
												69.2185 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	75.5175	73.4457	71.1838	68.3688	65.8574	63.2476	62.7056	64.9629	67.2780	69.9581	72.7980	75.4116 (44)
Distribution loss (46)m = 0.15 x (45)m	119.6013	104.5856	109.4068	93.5935	88.6568	77.7703	75.8369	80.4376	82.9605	94.9325	103.7140	118.0763 (45)
Water 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)
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	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	101.6611	88.8978	92.9958	79.5545	75.3583	66.1047	64.4614	68.3719	70.5164	80.6926	88.1569	100.3649 (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	101.6611	88.8978	92.9958	79.5545	75.3583	66.1047	64.4614	68.3719	70.5164	80.6926	88.1569	100.3649 (64)
12Total per year (kWh/year)												977.1363 (64)
Electric shower(s)	58.1356	51.7993	56.5629	53.9772	54.9901	52.4552	54.2037	54.9901	53.9772	56.5629	55.4993	58.1356 (64a)
												661.2892 (64a)
Heat gains from water heating, kWh/month	39.9492	35.1743	37.3897	33.3829	32.5871	29.6400	29.6663	30.8405	31.1234	34.3139	35.9141	39.6251 (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	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.9748	163.8292	147.9748	152.9073	147.9748	152.9073	147.9748	147.9748	152.9073	147.9748	152.9073	147.9748 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.3766	296.4209	288.7493	272.4173	251.8012	232.4249	219.4803	216.4360	224.1076	240.4396	261.0557	280.4320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256 (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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)
Water heating gains (Table 5)	53.6951	52.3427	50.2549	46.3652	43.7999	41.1667	39.8740	41.4523	43.2270	46.1208	49.8806	53.2596 (72)
Total internal gains	561.3234	578.8697	553.2559	537.9667	509.8527	492.7757	473.6060	472.1400	486.5187	500.8120	530.1205	547.9433 (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					10.6700	10.6334	0.6300	0.7000	0.7700	34.6743 (74)		
South					14.8000	46.7521	0.6300	0.7000	0.7700	211.4630 (78)		
West					3.9300	19.6403	0.6300	0.7000	0.7700	23.5891 (80)		
Solar gains	269.7264	458.7316	629.7468	790.2956	899.0410	899.8865	864.4365	781.3527	684.6021	507.1751	322.8438	231.0282 (83)
Total gains	831.0498	1037.6013	1183.0027	1328.2623	1408.8937	1392.6622	1338.0426	1253.4927	1171.1208	1007.9871	852.9644	778.9715 (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	47.7293	47.8351	47.9393	48.4348	48.5287	48.9704	48.9704	49.0531	48.7993	48.5287	48.3392	48.1427
alpha	4.1820	4.1890	4.1960	4.2290	4.2352	4.2647	4.2647	4.2702	4.2533	4.2352	4.2226	4.2095
util living area	0.9939	0.9844	0.9652	0.9130	0.8075	0.6369	0.4794	0.5281	0.7568	0.9392	0.9868	0.9953 (86)
MIT	19.3277	19.6091	19.9651	20.4036	20.7428	20.9319	20.9839	20.9759	20.8555	20.3977	19.7786	19.2818 (87)
Th 2	19.9091	19.9112	19.9133	19.9232	19.9251	19.9337	19.9337	19.9353	19.9304	19.9251	19.9213	19.9174 (88)
util rest of house	0.9922	0.9801	0.9553	0.8881	0.7546	0.5488	0.3691	0.4150	0.6774	0.9164	0.9824	0.9940 (89)
MIT 2	18.3966	18.6766	19.0273	19.4523	19.7528	19.9013	19.9292	19.9279	19.8513	19.4574	18.8542	18.3571 (90)
Living area fraction									fLA = Living area / (4) =			0.1236 (91)
MIT	18.5117	18.7919	19.1432	19.5699	19.8752	20.0287	20.0596	20.0574	19.9754	19.5737	18.9685	18.4714 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5117	18.7919	19.1432	19.5699	19.8752	20.0287	20.0596	20.0574	19.9754	19.5737	18.9685	18.4714 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9890	0.9741	0.9463	0.8784	0.7519	0.5572	0.3826	0.4285	0.6812	0.9070	0.9770	0.9914 (94)
Ext temp.	821.8879	1010.6759	1119.4348	1166.6950	1059.2859	775.9267	511.8713	537.1145	797.7100	914.2273	833.3418	772.2628 (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)
	2180.8353	2127.0334	1931.6378	1613.4833	1233.8392	811.9404	517.4271	546.0966	881.8278	1354.3516	1798.2810	2171.1929 (97)

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Space heating kWh	1011.0568	750.1922	604.2790	321.6876	129.8676	0.0000	0.0000	0.0000	0.0000	327.4525	694.7562	1040.8040 (98a)
Space heating requirement - total per year (kWh/year)												4880.0960
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	1011.0568	750.1922	604.2790	321.6876	129.8676	0.0000	0.0000	0.0000	0.0000	327.4525	694.7562	1040.8040 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4880.0960
Space heating per m2										(98c) / (4) =		38.5961 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8510	0.9110	0.8865	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1196.3557	1008.2343	1005.9306	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1565.7304	1504.7253	1408.8435	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	265.9498	369.3893	299.7672	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction									fc = cooled area / (4) =			1.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	66.4875	92.3473	74.9418	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement												233.7766 (107)
Energy for space heating												38.5961 (99)
Energy for space cooling												1.8489 (108)
Total												40.4451 (109)
Fabric Energy Efficiency (TFEE)												40.4 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	322.4220 (5)

2. Ventilation rate

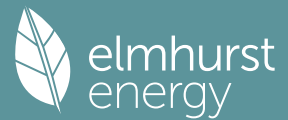
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) =	Air changes per hour 40.0000 / (5) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3241 (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) = 0.2755 (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	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237 (22b)
Effective ac	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524 (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
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511		(27)
Door 1.2			2.2200	1.2000	2.6640		(26)
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000 (28a)
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000 (29a)
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800 (30)
Total net area of external elements Aum(A, m2)			300.3500				(31)

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Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	82.8490		(33)
GF	87.5000		75.0000	6562.5000 (32c)
FF	113.6700		9.0000	1023.0300 (32c)
Internal Floor 1	63.2200		18.0000	1137.9600 (32d)
Internal Ceiling 1	63.2200		9.0000	568.9800 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26367.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5349 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	17.6200	0.0260	0.4581
E2 Other lintels (including other steel lintels)	7.7300	0.0230	0.1778
E3 Sill	84.7200	0.0180	1.5250
E4 Jamb	34.1000	0.0680	2.3188
E5 Ground floor (normal)	34.1000	0.0010	0.0341
E6 Intermediate floor within a dwelling	30.6000	0.0400	1.2240
E16 Corner (normal)	10.2000	0.0320	0.3264
E17 Corner (inverted - internal area greater than external area)	19.5000	0.0550	1.0725
E10 Eaves (insulation at ceiling level)	14.6000	0.0370	0.5402
E12 Gable (insulation at ceiling level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.6769 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	90.5259 (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	59.7614	59.5066	59.2568	58.0837	57.8643	56.8425	56.8425	56.6533	57.2361	57.8643	58.3083	58.7725	(38)
Heat transfer coeff	150.2873	150.0325	149.7828	148.6097	148.3902	147.3684	147.3684	147.1792	147.7620	148.3902	148.8342	149.2984	(39)
Average = Sum(39)m / 12 =												148.6086	
HLP	1.1886	1.1866	1.1846	1.1753	1.1736	1.1655	1.1655	1.1640	1.1686	1.1736	1.1771	1.1808	(40)
HLP (average)												1.1753	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8851 (42)
Hot water usage for mixer showers													
99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342	99.4342	(42a)
Hot water usage for baths													
31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	31.2350	(42b)
Hot water usage for other uses													
44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	44.1766	(42c)
Average daily hot water use (litres/day)												161.2461	(43)
Daily hot water use													
175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458	174.8458	(44)
Energy conte	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
41.6530	36.6881	38.5734	32.9199	31.2423	27.4206	26.5169	27.9704	28.7230	32.9066	36.0680	41.0649	41.0649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss													
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	(56)
If cylinder contains dedicated solar storage													
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	(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	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													
326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386	322.1386	(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													
326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386	322.1386	(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	0.0000	(64a)
Heat gains from water heating, kWh/month													
131.0287	116.2782	124.2023	110.4221	107.9517	98.2320	97.4770	100.6989	101.1190	111.6409	117.4003	129.7252	129.7252	(65)

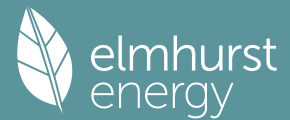
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
31.0582	27.5857	22.4342	16.9841	12.6958	10.7183	11.5815	15.0541	20.2056	25.6557	29.9440	31.9214	31.9214	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
437.8755	442.4193	430.9691	406.5931	375.8226	346.9028	327.5826	323.0388	334.4890	358.8650	389.6354	418.5553	418.5553	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	(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)													
-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	(71)
Water heating gains (Table 5)													
176.1138	173.0330	166.9386	153.3641	145.0964	136.4333	131.0174	135.3480	140.4430	150.0550	163.0560	174.3618	174.3618	(72)
Total internal gains													
757.9459	755.9363	733.2403	689.8396	646.5133	606.9529	583.0799	586.3393	608.0360	647.4741	695.5338	737.7369	737.7369	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	12.7900	10.6334	0.5000	0.7000	0.7700	32.9871 (74)
South	17.7400	46.7521	0.5000	0.7000	0.7700	201.1665 (78)
West	4.7100	19.6403	0.5000	0.7000	0.7700	22.4372 (80)

Solar gains	256.5908	436.3909	599.0764	751.8051	855.2540	856.0584	822.3349	743.2976	651.2597	482.4748	307.1213	219.7773 (83)
Total gains	1014.5367	1192.3272	1332.3167	1441.6448	1501.7673	1463.0113	1405.4148	1329.6369	1259.2957	1129.9489	1002.6551	957.5142 (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	48.7347	48.8175	48.8989	49.2849	49.3578	49.7000	49.7000	49.7639	49.5676	49.3578	49.2105	49.0575
alpha	4.2490	4.2545	4.2599	4.2857	4.2905	4.3133	4.3133	4.3176	4.3045	4.2905	4.2807	4.2705
util living area	0.9872	0.9743	0.9478	0.8884	0.7752	0.6065	0.4524	0.4952	0.7175	0.9130	0.9763	0.9898 (86)
Living	19.8324	20.0167	20.2670	20.5512	20.7708	20.8876	20.9191	20.9149	20.8436	20.5554	20.1347	19.7930
Non living	18.5775	18.8111	19.1238	19.4718	19.7161	19.8312	19.8524	19.8517	19.7951	19.4865	18.9686	18.5324
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	20.4027	20.0167	20.2670	20.5512	20.7708	20.8876	20.9191	20.9149	20.8436	20.5554	20.1347	19.9618 (87)
Th 2	19.9291	19.9307	19.9323	19.9398	19.9412	19.9477	19.9477	19.9489	19.9452	19.9412	19.9384	19.9354 (88)
util rest of house	0.9838	0.9675	0.9341	0.8592	0.7198	0.5208	0.3485	0.3886	0.6367	0.8836	0.9689	0.9871 (89)
MIT 2	19.3903	18.8111	19.1238	19.4718	19.7161	19.8312	19.8524	19.8517	19.7951	19.4865	18.9686	18.7852 (90)
Living area fraction									fLA =	Living area / (4) =		0.1236 (91)
MIT	19.5154	18.9601	19.2651	19.6053	19.8465	19.9618	19.9843	19.9831	19.9247	19.6186	19.1128	18.9307 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5154	18.9601	19.2651	19.6053	19.8465	19.9618	19.9843	19.9831	19.9247	19.6186	19.1128	18.9307 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9821	0.9596	0.9235	0.8485	0.7143	0.5220	0.3522	0.3922	0.6350	0.8727	0.9612	0.9836 (94)
Useful gains	996.4187	1144.1641	1230.3698	1223.1929	1072.7127	763.6615	495.0349	521.4516	799.6269	986.0594	963.7948	941.8054 (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	2286.6865	2109.4732	1911.9923	1590.9053	1208.8568	790.1587	498.7381	527.3652	860.6747	1338.2699	1787.9110	2199.2680 (97)
Space heating kWh	959.9592	648.6877	507.1271	264.7529	101.2912	0.0000	0.0000	0.0000	0.0000	262.0446	593.3637	935.5522 (98a)
Space heating requirement - total per year (kWh/year)												4272.7786
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	959.9592	648.6877	507.1271	264.7529	101.2912	0.0000	0.0000	0.0000	0.0000	262.0446	593.3637	935.5522 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4272.7786
Space heating per m2										(98c) / (4) =		33.7929 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												290.6420 (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	959.9592	648.6877	507.1271	264.7529	101.2912	0.0000	0.0000	0.0000	0.0000	262.0446	593.3637	935.5522 (98)
Space heating efficiency (main heating system 1)	290.6420	290.6420	290.6420	290.6420	290.6420	0.0000	0.0000	0.0000	0.0000	290.6420	290.6420	290.6420 (210)
Space heating fuel (main heating system)	330.2892	223.1913	174.4851	91.0924	34.8508	0.0000	0.0000	0.0000	0.0000	90.1606	204.1562	321.8916 (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	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386 (64)
Efficiency of water heater	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031	173.9031 (216)
Fuel for water heating, kWh/month	187.4946	165.7695	175.6890	153.1188	147.5848	132.0369	129.4695	135.0416	137.0297	153.9650	165.1870	185.2403 (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	27.1851	21.8089	19.6365	14.3865	11.1126	9.0791	10.1373	13.1768	17.1154	22.4563	25.3643	27.9407 (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)

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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												1470.1173	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												173.9031	
Water heating fuel used												1867.6268	(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)												219.3993	(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												3557.1434	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1470.1173	16.4900	242.4223	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1867.6268	16.4900	307.9717	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	219.3993	16.4900	36.1789	(250)
Additional standing charges			0.0000	(251)
Total energy cost			586.5730	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2317	(257)
SAP value		80.0338	
SAP rating (Section 12)		80	(258)
SAP band		C	

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	1470.1173	0.1561	229.4283	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1867.6268	0.1411	263.4768	(264)
Space and water heating			492.9051	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	219.3993	0.1443	31.6661	(268)
Total CO2, kg/year			524.5712	(272)
CO2 emissions per m2			4.1500	(273)
EI value			95.8999	
EI rating			96	(274)
EI band			A	

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

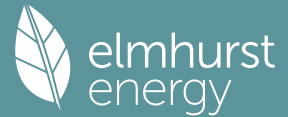
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280	(1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400			(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	322.4220	(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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1241 (8)
Pressure Test Yes
Pressure Test Method Blower Door
Measured/design AP50 4.0000 (17)
Infiltration rate 0.3241 (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) = 0.2755 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infiltr rate	0.2892	0.2755	0.2755	0.2548	0.2548	0.2272	0.2341	0.2204	0.2272	0.2410	0.2410	0.2617	(22b)
Effective ac	0.5418	0.5379	0.5379	0.5325	0.5325	0.5258	0.5274	0.5243	0.5258	0.5290	0.5290	0.5342	(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	
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511			(27)
Door 1.2			2.2200	1.2000	2.6640			(26)
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000	(28a)
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000	(29a)
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800	(30)
Total net area of external elements Aum(A, m2)			300.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.8490			(33)
GF			87.5000			75.0000	6562.5000	(32c)
FF			113.6700			9.0000	1023.0300	(32c)
Internal Floor 1			63.2200			18.0000	1137.9600	(32d)
Internal Ceiling 1			63.2200			9.0000	568.9800	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 26367.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5349 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	17.6200	0.0260	0.4581	
E3 Sill	7.7300	0.0230	0.1778	
E4 Jamb	84.7200	0.0180	1.5250	
E5 Ground floor (normal)	34.1000	0.0680	2.3188	
E6 Intermediate floor within a dwelling	34.1000	0.0010	0.0341	
E16 Corner (normal)	30.6000	0.0400	1.2240	
E17 Corner (inverted - internal area greater than external area)	10.2000	0.0320	0.3264	
E10 Eaves (insulation at ceiling level)	19.5000	0.0550	1.0725	
E12 Gable (insulation at ceiling level)	14.6000	0.0370	0.5402	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6769 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 90.5259 (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	
	57.6498	57.2361	57.2361	56.6533	56.6533	55.9469	56.1160	55.7830	55.9469	56.2900	56.2900	56.8425	(38)
Heat transfer coeff	148.1757	147.7620	147.7620	147.1792	147.1792	146.4729	146.6419	146.3089	146.4729	146.8160	146.8160	147.3684	(39)
Average = Sum(39)m / 12 =												147.0796	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1719	1.1686	1.1686	1.1640	1.1640	1.1584	1.1598	1.1571	1.1584	1.1612	1.1612	1.1655	(40)
HLP (average)												1.1632	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8851 (42)
Hot water usage for mixer showers													
	99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342	(42a)
Hot water usage for baths													
	31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	(42b)
Hot water usage for other uses													
	44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	(42c)
Average daily hot water use (litres/day)													161.2461 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458	(44)
Energy conte	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662	(45)
Energy content (annual)										Total = Sum(45)m =			2678.3144

Distribution loss (46)m = 0.15 x (45)m
41.6530 36.6881 38.5734 32.9199 31.2423 27.4206 26.5169 27.9704 28.7230 32.9066 36.0680 41.0649 (46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8100 (55)

Total storage loss 25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 25.1100 24.3000 25.1100 24.3000 25.1100 (56)

If cylinder contains dedicated solar storage 25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 25.1100 24.3000 25.1100 24.3000 25.1100 (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 326.0588 288.2783 305.5285 266.2783 256.6545 229.6162 225.1515 234.8416 238.2988 267.7499 287.2653 322.1386 (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)

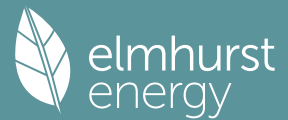
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)

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 326.0588 288.2783 305.5285 266.2783 256.6545 229.6162 225.1515 234.8416 238.2988 267.7499 287.2653 322.1386 (64)

Electric shower(s) Total per year (kWh/year) = Sum(64)m = 3247.8604 (64)

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	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	131.0287	116.2782	124.2023	110.4221	107.9517	98.2320	97.4770	100.6989	101.1190	111.6409	117.4003	129.7252 (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
	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0582	27.5857	22.4342	16.9841	12.6958	10.7183	11.5815	15.0541	20.2056	25.6557	29.9440	31.9214 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	437.8755	442.4193	430.9691	406.5931	375.8226	346.9028	327.5826	323.0388	334.4890	358.8650	389.6354	418.5553 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959 (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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)
Water heating gains (Table 5)	176.1138	173.0330	166.9386	153.3641	145.0964	136.4333	131.0174	135.3480	140.4430	150.0550	163.0560	174.3618 (72)
Total internal gains	757.9459	755.9363	733.2403	689.8396	646.5133	606.9529	583.0799	586.3393	608.0360	647.4741	695.5338	737.7369 (73)

6. Solar gains

[Jan]												Gains W	
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		
North	12.7900				11.9814		0.5000		0.7000		0.7700		37.1690 (74)
South	17.7400				50.9848		0.5000		0.7000		0.7700		219.3794 (78)
West	4.7100				22.3313		0.5000		0.7000		0.7700		25.5115 (80)
Solar gains	282.0599	431.8152	587.3146	764.4816	852.3805	915.4404	868.8993	799.2299	693.6406	510.1112	345.8631	239.2841 (83)	
Total gains	1040.0058	1187.7515	1320.5549	1454.3212	1498.8938	1522.3933	1451.9792	1385.5692	1301.6766	1157.5854	1041.3969	977.0210 (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	49.4292	49.5676	49.5676	49.7639	49.7639	50.0039	49.9462	50.0599	50.0039	49.8870	49.8870	49.7000
alpha	4.2953	4.3045	4.3045	4.3176	4.3176	4.3336	4.3297	4.3373	4.3336	4.3258	4.3258	4.3133
util living area	0.9831	0.9699	0.9369	0.8559	0.7034	0.4704	0.3117	0.3359	0.6129	0.8760	0.9656	0.9865 (86)
Living	19.9566	20.1092	20.3652	20.6446	20.8385	20.9168	20.9271	20.9267	20.8909	20.6613	20.2692	19.9222
Non living	18.7456	18.9390	19.2554	19.5871	19.7898	19.8567	19.8605	19.8626	19.8409	19.6162	19.1470	18.7063
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	20.4662	20.1092	20.3652	20.6446	20.8385	20.9168	20.9271	20.9267	20.8909	20.6613	20.2692	20.0729 (87)
Th 2	19.9425	19.9452	19.9452	19.9489	19.9489	19.9534	19.9523	19.9544	19.9534	19.9512	19.9512	19.9477 (88)
util rest of house	0.9785	0.9619	0.9199	0.8187	0.6344	0.3768	0.2071	0.2272	0.5177	0.8348	0.9546	0.9827 (89)
MIT 2	19.4654	18.9390	19.2554	19.5871	19.7898	19.8567	19.8605	19.8626	19.8409	19.6162	19.1470	18.9300 (90)
Living area fraction	19.5891	19.0836	19.3926	19.7178	19.9195	19.9878	19.9923	19.9941	fLA = Living area / (4) =	19.7454	19.2858	0.1236 (91)
MIT	19.5891	19.0836	19.3926	19.7178	19.9195	19.9878	19.9923	19.9941	19.9707	19.7454	19.2858	19.0713 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5891	19.0836	19.3926	19.7178	19.9195	19.9878	19.9923	19.9941	19.9707	19.7454	19.2858	19.0713 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9766	0.9534	0.9090	0.8093	0.6324	0.3799	0.2111	0.2314	0.5194	0.8252	0.9456	0.9785 (94)
Useful gains	1015.6439	1132.4373	1200.4360	1177.0090	947.8281	578.3984	306.5312	320.5890	676.1190	955.2468	984.7271	956.0114 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	2146.9311	1992.3700	1772.0548	1444.9758	1018.4001	584.0998	306.8202	321.0231	698.7832	1195.8720	1656.9294	2058.9285 (97)
Space heating kWh	841.6777	577.8748	425.2844	192.9361	52.5056	0.0000	0.0000	0.0000	0.0000	179.0251	483.9856	820.5703 (98a)
Space heating requirement - total per year (kWh/year)												3573.8596
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	841.6777	577.8748	425.2844	192.9361	52.5056	0.0000	0.0000	0.0000	0.0000	179.0251	483.9856	820.5703 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3573.8596
Space heating per m2										(98c) / (4) =		28.2653 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												290.3890 (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
	841.6777	577.8748	425.2844	192.9361	52.5056	0.0000	0.0000	0.0000	0.0000	179.0251	483.9856	820.5703 (98)
Space heating efficiency (main heating system 1)	290.3890	290.3890	290.3890	290.3890	290.3890	0.0000	0.0000	0.0000	0.0000	290.3890	290.3890	290.3890 (210)

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Space heating fuel (main heating system)	289.8449	199.0003	146.4533	66.4406	18.0811	0.0000	0.0000	0.0000	0.0000	61.6501	166.6680	282.5763	(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	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386	(64)
Efficiency of water heater												173.8836	(216)
(217)m	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	(217)
Fuel for water heating, kWh/month	187.5155	165.7881	175.7086	153.1359	147.6013	132.0517	129.4840	135.0567	137.0450	153.9822	165.2055	185.2610	(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	27.1851	21.8089	19.6365	14.3865	11.1126	9.0791	10.1373	13.1768	17.1154	22.4563	25.3643	27.9407	(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												1230.7146	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												173.8836	
Water heating fuel used												1867.8357	(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)												219.3993	(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												3317.9495	(238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1230.7146	26.0600	320.7242 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1867.8357	26.0600	486.7580 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	219.3993	26.0600	57.1755 (250)
Additional standing charges			0.0000 (251)
Total energy cost			864.6577 (255)

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	1230.7146	0.1568	192.9911 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1867.8357	0.1411	263.5063 (264)
Space and water heating			456.4973 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	219.3993	0.1443	31.6661 (268)
Total CO2, kg/year			488.1634 (272)

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	1230.7146	1.5805	1945.1614 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1867.8357	1.5217	2842.2030 (278)
Space and water heating			4787.3644 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	219.3993	1.5338	336.5219 (282)
Total Primary energy kWh/year			5123.8863 (286)

SAP 10 EPC IMPROVEMENTS

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Be Green Act

Current energy efficiency rating:
Current environmental impact rating:

C 80
A 96

N Solar water heating
U Solar photovoltaic panels
V2 Wind turbine

Recommended
Recommended
Not applicable

Recommended measures:
N Solar water heating
U Solar photovoltaic panels

SAP change Cost change CO2 change
+ 1.8 -£ 94 -45 kg (9.2%)
+ 5.2 -£ 248 -128 kg (28.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£94	0.36 kg/m²	B 82 A 96
Solar photovoltaic panels	£248	1.01 kg/m²	B 87 A 97
Total Savings	£342	1.37 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 560 TEST (06 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£865	£770	£94
Space heating	£321	£342	-£21
Water heating	£487	£371	£116
Lighting	£57	£57	£0
Generated (PV)	-£0	-£248	£248
Total cost of fuels	£865	£522	£342
Total cost of uses	£865	£522	£343
Delivered energy	26 kWh/m²	16 kWh/m²	10 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.3 tonnes	0.2 tonnes
CO2 emissions per m²	4 kg/m²	2 kg/m²	1 kg/m²
Primary energy	41 kWh/m²	25 kWh/m²	15 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	322.4220 (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) = 0.1241 (8)

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

Blower Door
Yes
4.0000 (17)
0.3241 (18)
2 (19)

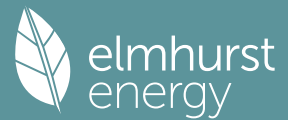
Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.2755 (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	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237 (22b)
Effective ac	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524 (25)

3. Heat losses and heat loss parameter

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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							
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511			(27)						
Door 1.2			2.2200	1.2000	2.6640			(26)						
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000	(28a)						
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000	(29a)						
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800	(30)						
Total net area of external elements Aum(A, m2)			300.3500					(31)						
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.8490			(33)						
GF			87.5000			75.0000	6562.5000	(32c)						
FF			113.6700			9.0000	1023.0300	(32c)						
Internal Floor 1			63.2200			18.0000	1137.9600	(32d)						
Internal Ceiling 1			63.2200			9.0000	568.9800	(32e)						
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		26367.1500	(34)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5349	(35)						
List of Thermal Bridges														
K1 Element				Length	Psi-value	Total								
E2 Other lintels (including other steel lintels)				17.6200	0.0260	0.4581								
E3 Sill				7.7300	0.0230	0.1778								
E4 Jamb				84.7200	0.0180	1.5250								
E5 Ground floor (normal)				34.1000	0.0680	2.3188								
E6 Intermediate floor within a dwelling				34.1000	0.0010	0.0341								
E16 Corner (normal)				30.6000	0.0400	1.2240								
E17 Corner (inverted - internal area greater than external area)				10.2000	0.0320	0.3264								
E10 Eaves (insulation at ceiling level)				19.5000	0.0550	1.0725								
E12 Gable (insulation at ceiling level)				14.6000	0.0370	0.5402								
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6769	(36)						
Point Thermal bridges						(36a) =	0.0000							
Total fabric heat loss						(33) + (36) + (36a) =	90.5259	(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	59.7614	59.5066	59.2568	58.0837	57.8643	56.8425	56.8425	56.6533	57.2361	57.8643	58.3083	58.7725	(38)	
Average = Sum(39)m / 12 =	150.2873	150.0325	149.7828	148.6097	148.3902	147.3684	147.3684	147.1792	147.7620	148.3902	148.8342	149.2984	(39)	
												148.6086		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.1886	1.1866	1.1846	1.1753	1.1736	1.1655	1.1655	1.1640	1.1686	1.1736	1.1771	1.1808	(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													2.8851	(42)
Hot water usage for mixer showers														
	99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342	(42a)	
Hot water usage for baths														
	31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	(42b)	
Hot water usage for other uses														
	44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	(42c)	
Average daily hot water use (litres/day)													161.2461	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458	(44)	
Energy content (annual)	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662	(45)	
Distribution loss (46)m = 0.15 x (45)m														
	41.6530	36.6881	38.5734	32.9199	31.2423	27.4206	26.5169	27.9704	28.7230	32.9066	36.0680	41.0649	(46)	
Water storage loss:														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5000	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.8100	(55)
Total storage loss														
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)	
If cylinder contains dedicated solar storage														
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(57)	
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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														
	326.0588	288.2783	304.1328	259.5247	243.8602	217.0095	212.1245	222.7451	232.8960	266.3541	287.2653	322.1386	(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)	
Aperture area of solar collector													3.0000	(H1)
Zero-loss collector efficiency													0.8000	(H2)
Collector linear heat loss coefficient													1.8000	(H3)
Collector 2nd order heat loss coefficient													0.0000	(H4)
Collector loop efficiency													0.9000	(H5)
Incidence angle modifier													1.0000	(H6)
Overshading factor													0.8000	(H8)
Overall heat loss coefficient of system													6.5000	(H10)
Heat loss coefficient of collector loop													3.9667	(H11)
Dedicated solar storage volume													75.0000	(H12)
Effective solar volume													75.0000	(H14)
Reference volume													225.0000	(H15)
Storage tank correction coefficient													1.3161	(H16)
Heat delivered to hot water													645.3337	(H24)
Heat delivered to space heating													0.0000	(H29)
Solar input													645.3337	
Solar input	-0.0000	-16.1732	-59.5648	-82.8815	-109.6465	-101.2223	-100.5255	-87.1687	-59.3029	-28.8483	-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														
	326.0588	272.1052	244.5679	176.6432	134.2137	115.7872	111.5990	135.5764	173.5930	237.5058	287.2653	322.1386	(64)	
													2537.0542	(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														
	131.0287	116.2782	123.0857	105.0193	97.7163	88.1466	87.0554	91.0218	96.7967	110.5243	117.4003	129.7252	(65)	

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0582	27.5857	22.4342	16.9841	12.6958	10.7183	11.5815	15.0541	20.2056	25.6557	29.9440	31.9214
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	437.8755	442.4193	430.9691	406.5931	375.8226	346.9028	327.5826	323.0388	334.4890	358.8650	389.6354	418.5553
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959
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
Losses e.g. evaporation (negative values) (Table 5)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050
Water heating gains (Table 5)	176.1138	173.0330	165.4378	145.8601	131.3391	122.4259	117.0099	122.3411	134.4398	148.5542	163.0560	174.3618
Total internal gains	757.9459	755.9363	731.7395	682.3356	632.7559	592.9454	569.0725	573.3324	602.0328	645.9733	695.5338	737.7369

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					12.7900	10.6334	0.5000	0.7000	0.7700		32.9871 (74)	
South					17.7400	46.7521	0.5000	0.7000	0.7700		201.1665 (78)	
West					4.7100	19.6403	0.5000	0.7000	0.7700		22.4372 (80)	
Solar gains	256.5908	436.3909	599.0764	751.8051	855.2540	856.0584	822.3349	743.2976	651.2597	482.4748	307.1213	219.7773 (83)
Total gains	1014.5367	1192.3272	1330.8159	1434.1408	1488.0099	1449.0038	1391.4074	1316.6300	1253.2925	1128.4481	1002.6551	957.5142 (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	Dec
tau	48.7347	48.8175	48.8989	49.2849	49.3578	49.7000	49.7000	49.7639	49.5676	49.3578	49.2105	49.0575
alpha	4.2490	4.2545	4.2599	4.2857	4.2905	4.3133	4.3133	4.3176	4.3045	4.2905	4.2807	4.2705
util living area	0.9872	0.9743	0.9480	0.8899	0.7792	0.6112	0.4566	0.4996	0.7197	0.9133	0.9763	0.9898
Living	19.8324	20.0167	20.2661	20.5480	20.7674	20.8864	20.9188	20.9144	20.8425	20.5546	20.1347	19.7930
Non living	18.5775	18.8111	19.1228	19.4682	19.7129	19.8304	19.8523	19.8515	19.7943	19.4856	18.9686	18.5324
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	20.4027	20.0167	20.2661	20.5480	20.7674	20.8864	20.9188	20.9144	20.8425	20.5546	20.1347	19.7930
Th 2	19.9291	19.9307	19.9323	19.9398	19.9412	19.9477	19.9477	19.9489	19.9452	19.9412	19.9384	19.9354
util rest of house	0.9838	0.9675	0.9343	0.8610	0.7242	0.5252	0.3519	0.3923	0.6391	0.8840	0.9689	0.9871
MIT 2	19.3903	18.8111	19.1228	19.4682	19.7129	19.8304	19.8523	19.8515	19.7943	19.4856	18.9686	18.7852
Living area fraction	19.5154	18.9601	19.2641	19.6017	19.8433	19.9609	19.9841	19.9829	19.9239	19.6178	19.1128	18.9307
MIT	19.5154	18.9601	19.2641	19.6017	19.8433	19.9609	19.9841	19.9829	19.9239	19.6178	19.1128	18.9307
Temperature adjustment												0.0000
adjusted MIT	19.5154	18.9601	19.2641	19.6017	19.8433	19.9609	19.9841	19.9829	19.9239	19.6178	19.1128	18.9307

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9821	0.9596	0.9237	0.8502	0.7185	0.5264	0.3557	0.3959	0.6373	0.8731	0.9612	0.9836
Useful gains	996.4187	1144.1641	1229.2915	1219.3247	1069.1199	762.6889	494.8702	521.2010	798.6692	985.1983	963.7948	941.8054
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
Heat loss rate W	2286.6865	2109.4732	1911.8409	1590.3712	1208.3787	790.0330	498.7156	527.3315	860.5489	1338.1504	1787.9110	2199.2680
Space heating kWh	959.9592	648.6877	507.8167	267.1535	103.6085	0.0000	0.0000	0.0000	0.0000	262.5963	593.3637	935.5522
Space heating requirement - total per year (kWh/year)												4278.7378
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
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	959.9592	648.6877	507.8167	267.1535	103.6085	0.0000	0.0000	0.0000	0.0000	262.5963	593.3637	935.5522
Space heating requirement after solar contribution - total per year (kWh/year)												4278.7378
Space heating per m ²										(98c) / (4) =		33.8401

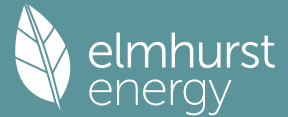
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000
Fraction of space heat from main system(s)												1.0000
Efficiency of main space heating system 1 (in %)												290.6420
Efficiency of main space heating system 2 (in %)												0.0000
Efficiency of secondary/supplementary heating system, %												0.0000
Space heating requirement	959.9592	648.6877	507.8167	267.1535	103.6085	0.0000	0.0000	0.0000	0.0000	262.5963	593.3637	935.5522
Space heating efficiency (main heating system 1)	290.6420	290.6420	290.6420	290.6420	290.6420	0.0000	0.0000	0.0000	0.0000	290.6420	290.6420	290.6420
Space heating fuel (main heating system)	330.2892	223.1913	174.7224	91.9184	35.6481	0.0000	0.0000	0.0000	0.0000	90.3504	204.1562	321.8916
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
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
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

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energy

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	1472.1677	0.1560	229.7137 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1458.8899	0.1450	211.5608 (264)
Space and water heating			441.2746 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	219.3993	0.1443	31.6661 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-923.9300	0.1343	-124.0602
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-124.0602 (269)
Total CO2, kg/year			359.9775 (272)
CO2 emissions per m2			2.8500 (273)
EI value			97.1864
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	322.4220 (5)

2. Ventilation rate

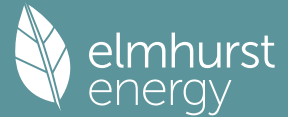
m ³ per hour												
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												4 * 10 = 40.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												40.0000 / (5) = 0.1241 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												4.0000 (17)
Infiltration rate												0.3241 (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) = 0.2755 (21)
Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2892	0.2755	0.2755	0.2548	0.2548	0.2272	0.2341	0.2204	0.2272	0.2410	0.2410	0.2617 (22b)
Effective ac	0.5418	0.5379	0.5379	0.5325	0.5325	0.5258	0.5274	0.5243	0.5258	0.5290	0.5290	0.5342 (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						
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511			(27)					
Door 1.2			2.2200	1.2000	2.6640			(26)					
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000	(28a)					
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000	(29a)					
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800	(30)					
Total net area of external elements Aum(A, m2)			300.3500					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.8490			(33)					
GF			87.5000			75.0000	6562.5000	(32c)					
FF			113.6700			9.0000	1023.0300	(32c)					
Internal Floor 1			63.2200			18.0000	1137.9600	(32d)					
Internal Ceiling 1			63.2200			9.0000	568.9800	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26367.1500	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5349	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				17.6200	0.0260	0.4581							
E3 Sill				7.7300	0.0230	0.1778							
E4 Jamb				84.7200	0.0180	1.5250							
E5 Ground floor (normal)				34.1000	0.0680	2.3188							
E6 Intermediate floor within a dwelling				34.1000	0.0010	0.0341							
E16 Corner (normal)				30.6000	0.0400	1.2240							
E17 Corner (inverted - internal area greater than external area)				10.2000	0.0320	0.3264							
E10 Eaves (insulation at ceiling level)				19.5000	0.0550	1.0725							
E12 Gable (insulation at ceiling level)				14.6000	0.0370	0.5402							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6769	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	90.5259	(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	57.6498	57.2361	57.2361	56.6533	56.6533	55.9469	56.1160	55.7830	55.9469	56.2900	56.2900	56.8425	(38)
Heat transfer coeff	148.1757	147.7620	147.7620	147.1792	147.1792	146.4729	146.6419	146.3089	146.4729	146.8160	146.8160	147.3684	(39)
Average = Sum(39)m / 12 =												147.0796	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1719	1.1686	1.1686	1.1640	1.1640	1.1584	1.1598	1.1571	1.1584	1.1612	1.1612	1.1655	(40)
HLP (average)												1.1632	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.8851 (42)
Hot water usage for mixer showers												
99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342 (42a)	
Hot water usage for baths												
31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350 (42b)	
Hot water usage for other uses												
44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766 (42c)	
Average daily hot water use (litres/day)												161.2461 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458 (44)
Energy content	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662 (45)
Energy content (annual)												Total = Sum(45)m = 2678.3144
Distribution loss (46)m = 0.15 x (45)m												
41.6530	36.6881	38.5734	32.9199	31.2423	27.4206	26.5169	27.9704	28.7230	32.9066	36.0680	41.0649 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss												
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)	
If cylinder contains dedicated solar storage												
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (57)	
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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												
326.0588	288.2783	304.1328	259.5247	243.8602	217.0095	212.1245	222.7451	232.8960	266.3541	287.2653	322.1386 (62)	
WWHRS	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 (63b)	
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												705.8475 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												705.8475
Solar input	-0.0000	-17.5822	-60.6302	-87.5260	-111.8020	-111.7054	-109.5226	-98.5657	-68.4966	-36.0156	-4.0010	-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 (64a)	
Output from w/h												
326.0588	270.6961	243.5026	171.9986	132.0582	105.3041	102.6019	124.1794	164.3993	230.3385	283.2643	322.1386 (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												
131.0287	116.2782	123.0857	105.0193	97.7163	88.1466	87.0554	91.0218	96.7967	110.5243	117.4003	129.7252 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
31.0582	27.5857	22.4342	16.9841	12.6958	10.7183	11.5815	15.0541	20.2056	25.6557	29.9440	31.9214 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
437.8755	442.4193	430.9691	406.5931	375.8226	346.9028	327.5826	323.0388	334.4890	358.8650	389.6354	418.5553 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959 (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)												
-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)	
Water heating gains (Table 5)												
176.1138	173.0330	165.4378	145.8601	131.3391	122.4259	117.0099	122.3411	134.4398	148.5542	163.0560	174.3618 (72)	
Total internal gains	757.9459	755.9363	731.7395	682.3356	632.7559	592.9454	569.0725	573.3324	602.0328	645.9733	695.5338	737.7369 (73)

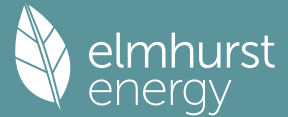
6. Solar gains

[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					12.7900	11.9814		0.5000	0.7000		0.7700		37.1690 (74)	
South					17.7400	50.9848		0.5000	0.7000		0.7700		219.3794 (78)	
West					4.7100	22.3313		0.5000	0.7000		0.7700		25.5115 (80)	
Solar gains	282.0599	431.8152	587.3146	764.4816	852.3805	915.4404	868.8993	799.2299	693.6406	510.1112	345.8631	239.2841 (83)		
Total gains	1040.0058	1187.7515	1319.0541	1446.8172	1485.1365	1508.3858	1437.9717	1372.5623	1295.6734	1156.0846	1041.3969	977.0210 (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	49.4292	49.5676	49.5676	49.7639	49.7639	50.0039	49.9462	50.0599	50.0039	49.8870	49.8870	49.7000
alpha	4.2953	4.3045	4.3045	4.3176	4.3176	4.3336	4.3297	4.3373	4.3336	4.3258	4.3258	4.3133
util living area	0.9831	0.9699	0.9372	0.8577	0.7078	0.4744	0.3147	0.3390	0.6152	0.8764	0.9656	0.9865 (86)
Living	19.9566	20.1092	20.3644	20.6418	20.8363	20.9164	20.9270	20.9266	20.8903	20.6607	20.2692	19.9222

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Non living	18.7456	18.9390	19.2545	19.5841	19.7880	19.8565	19.8604	19.8626	19.8406	19.6155	19.1470	18.7063
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	20.4662	20.1092	20.3644	20.6418	20.8363	20.9164	20.9270	20.9266	20.8903	20.6607	20.2692	20.0729 (87)
Th 2	19.9425	19.9452	19.9452	19.9489	19.9489	19.9534	19.9523	19.9544	19.9534	19.9512	19.9512	19.9477 (88)
util rest of house												
	0.9785	0.9619	0.9202	0.8208	0.6390	0.3801	0.2091	0.2294	0.5199	0.8353	0.9546	0.9827 (89)
MIT 2	19.4654	18.9390	19.2545	19.5841	19.7880	19.8565	19.8604	19.8626	19.8406	19.6155	19.1470	18.9300 (90)
Living area fraction									FLA = Living area / (4) =			0.1236 (91)
MIT	19.5891	19.0836	19.3917	19.7148	19.9175	19.9876	19.9923	19.9941	19.9704	19.7447	19.2858	19.0713 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5891	19.0836	19.3917	19.7148	19.9175	19.9876	19.9923	19.9941	19.9704	19.7447	19.2858	19.0713 (93)

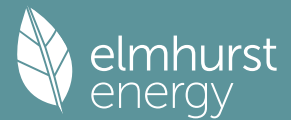
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9766	0.9534	0.9093	0.8113	0.6368	0.3833	0.2132	0.2336	0.5215	0.8257	0.9456	0.9785 (94)
Useful gains	1015.6439	1132.4373	1199.4256	1173.8107	945.6666	578.1690	306.5173	320.5689	675.7185	954.5590	984.7271	956.0114 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	2146.9311	1992.3700	1771.9144	1444.5421	1018.1191	584.0695	306.8179	321.0199	698.7312	1195.7783	1656.9294	2058.9285 (97)
Space heating kWh	841.6777	577.8748	425.9317	194.9266	53.9047	0.0000	0.0000	0.0000	0.0000	179.4671	483.9856	820.5703 (98a)
Space heating requirement - total per year (kWh/year)												3578.3385
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	841.6777	577.8748	425.9317	194.9266	53.9047	0.0000	0.0000	0.0000	0.0000	179.4671	483.9856	820.5703 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3578.3385
Space heating per m2										(98c) / (4) =		28.3007 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												290.3890 (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	841.6777	577.8748	425.9317	194.9266	53.9047	0.0000	0.0000	0.0000	0.0000	179.4671	483.9856	820.5703 (98)
Space heating efficiency (main heating system 1)	290.3890	290.3890	290.3890	290.3890	290.3890	0.0000	0.0000	0.0000	0.0000	290.3890	290.3890	290.3890 (210)
Space heating fuel (main heating system)	289.8449	199.0003	146.6763	67.1260	18.5629	0.0000	0.0000	0.0000	0.0000	61.8023	166.6680	282.5763 (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	326.0588	270.6961	243.5026	171.9986	132.0582	105.3041	102.6019	124.1794	164.3993	230.3385	283.2643	322.1386 (64)
Efficiency of water heater (217)m	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836	173.8836 (216)
Fuel for water heating, kWh/month	187.5155	155.6766	140.0377	98.9160	75.9463	60.5601	59.0061	71.4152	94.5456	132.4670	162.9045	185.2610 (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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	27.1851	21.8089	19.6365	14.3865	11.1126	9.0791	10.1373	13.1768	17.1154	22.4563	25.3643	27.9407 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.4938	-59.5101	-88.6956	-103.7171	-109.0006	-104.2316	-102.0690	-97.1026	-85.6059	-71.2492	-49.4512	-36.7677 (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												1232.2570 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												173.8836
Water heating fuel used												1424.2517 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												80.0000 (231)
Electricity for lighting (calculated in Appendix L)												219.3993 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-950.8944 (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												2005.0136 (238)

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10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1232.2570	26.0600	321.1262 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1424.2517	26.0600	371.1600 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	26.0600	20.8480 (249)
Energy for lighting	219.3993	26.0600	57.1755 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-950.8944	26.0600	-247.8031
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-247.8031 (252)
Total energy cost			522.5065 (255)

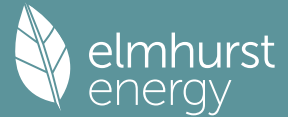
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1232.2570	0.1568	193.2075 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1424.2517	0.1455	207.2306 (264)
Space and water heating			400.4380 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	219.3993	0.1443	31.6661 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-950.8944	0.1343	-127.7082
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-127.7082 (269)
Total CO2, kg/year			315.4929 (272)

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	1232.2570	1.5804	1947.5050 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1424.2517	1.5382	2190.8117 (278)
Space and water heating			4138.3168 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	219.3993	1.5338	336.5219 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-950.8944	1.4963	-1422.8655
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1422.8655 (283)
Total Primary energy kWh/year			3172.9972 (286)

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Property Reference	House Type B				Issued on Date	29/01/2025
Assessment Reference	Be Green Act		Prop Type Ref			
Property						
SAP Rating	81 B	DER	4.47	TER	10.10	
Environmental	96 A	% DER < TER				55.74
CO ₂ Emissions (t/year)	0.38	DFEE	32.71	TFEE	34.48	
Compliance Check	See BREL	% DFEE < TFEE				5.14
% DPER < TPER	10.18	DPER	47.14	TPER	52.48	
Assessor Details	Mr. James Rivers				Assessor ID	R423-0001
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)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (5)

2. Ventilation rate

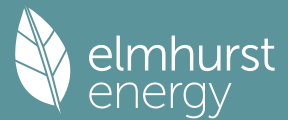
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1258 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3258 (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) = 0.2770 (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	0.3531	0.3462	0.3393	0.3046	0.2977	0.2631	0.2631	0.2562	0.2770	0.2977	0.3116	0.3254 (22b)
Effective ac	0.5623	0.5599	0.5576	0.5464	0.5443	0.5346	0.5346	0.5328	0.5384	0.5443	0.5485	0.5529 (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
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000 (28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800 (29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500 (30)
Total net area of external elements Aum(A, m ²)			192.5440				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.7053		(33)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000 (32)
GF			92.6800			75.0000	6951.0000 (32c)
FF			100.4900			9.0000	904.4100 (32c)
Internal Floor 1			46.7500			18.0000	841.5000 (32d)
Internal Ceiling 1			46.7500			9.0000	420.7500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	22063.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.9764 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.6400	0.0260	0.2766	
E3 Sill				4.9000	0.0230	0.1127	

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E4 Jamb									54.7600	0.0180	0.9857	
E5 Ground floor (normal)									19.4200	0.0680	1.3206	
E6 Intermediate floor within a dwelling									19.4200	0.0010	0.0194	
E16 Corner (normal)									10.2000	0.0400	0.4080	
E18 Party wall between dwellings									10.2000	0.0320	0.3264	
E25 Staggered party wall between dwellings									2.4000	0.0280	0.0672	
P1 Party wall - Ground floor									8.8200	0.0580	0.5116	
E10 Eaves (insulation at ceiling level)									10.6000	0.0550	0.5830	
E12 Gable (insulation at ceiling level)									8.8200	0.0370	0.3263	
P4 Party wall - Roof (insulation at ceiling level)									8.8200	0.0330	0.2911	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.2286 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 55.9338 (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	44.2454	44.0549	43.8682	42.9913	42.8272	42.0634	42.0634	41.9220	42.3576	42.8272	43.1591	43.5061 (38)
Average = Sum(39)m / 12 =	100.1793	99.9888	99.8021	98.9251	98.7610	97.9972	97.9972	97.8558	98.2914	98.7610	99.0930	99.4400 (39)
												98.9243
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0714	1.0694	1.0674	1.0580	1.0563	1.0481	1.0481	1.0466	1.0512	1.0563	1.0598	1.0635 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.0580

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.6707 (42)
Hot water usage for mixer showers												
	94.8722	93.4465	91.3689	87.3938	84.4603	81.1888	79.3294	81.3912	83.6514	87.1639	91.2244	94.5087 (42a)
Hot water usage for baths												
	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939 (42b)
Hot water usage for other uses												
	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802 (42c)
Average daily hot water use (litres/day)												153.2572 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	166.6471	163.2523	159.0250	152.3745	147.0541	141.3022	138.9274	143.1346	147.5950	153.6549	160.4145	166.1829 (44)
Energy conte	263.9282	232.4691	244.4155	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022 (45)
Energy content (annual)												2545.6173
Distribution loss (46)m = 0.15 x (45)m												
	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss												
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage												
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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 (58)
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 (59)
Total heat required for water heating calculated for each month												
	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746 (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												
	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746 (64)
12Total per year (kWh/year)												3115.1633 (64)
Electric shower(s)												3115 (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												
	126.4541	112.2489	119.9661	106.8068	104.5206	95.2206	94.5648	97.6271	97.9644	108.0269	113.4391	125.2152 (65)

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

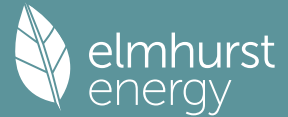
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	123.8795	137.1523	123.8795	128.0088	123.8795	128.0088	123.8795	123.8795	128.0088	123.8795	128.0088	123.8795 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451 (68)
Pumps, fans	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265 (71)
Total internal gains	169.9651	167.0371	161.2447	148.3427	140.4847	132.2509	127.1032	131.2192	136.0617	145.1974	157.5543	168.2999 (72)
	602.2761	615.1670	589.6855	567.2533	538.0232	517.7129	497.6095	499.1793	514.5674	533.2334	566.9623	589.7844 (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				7.0200	10.6334	0.5000	0.7000			0.7700		18.1055 (74)
South				13.2300	46.7521	0.5000	0.7000			0.7700		150.0244 (78)

Solar gains	168.1299	280.3018	371.7746	448.1746	495.8325	490.9320	473.7553	437.4787	397.6348	306.1993	200.1655	144.7285 (83)

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Total gains 770.4060 895.4689 961.4602 1015.4279 1033.8557 1008.6449 971.3647 936.6580 912.2022 839.4327 767.1279 734.5129 (84)

7. Mean internal temperature (heating season)

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

21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.1786	61.2952	61.4099	61.9542	62.0572	62.5408	62.5408	62.6312	62.3537	62.0572	61.8493	61.6335
alpha	5.0786	5.0863	5.0940	5.1303	5.1371	5.1694	5.1694	5.1754	5.1569	5.1371	5.1233	5.1089
util living area	0.9894	0.9769	0.9544	0.8973	0.7838	0.6005	0.4402	0.4749	0.6942	0.9087	0.9773	0.9915 (86)
Living	20.1071	20.2674	20.4551	20.6778	20.8406	20.9203	20.9367	20.9352	20.8987	20.6976	20.3649	20.0773
Non living	18.9902	19.1932	19.4277	19.7002	19.8780	19.9553	19.9654	19.9661	19.9373	19.7296	19.3245	18.9577
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	20.5432	20.2674	20.4551	20.6778	20.8406	20.9203	20.9367	20.9352	20.8987	20.6976	20.3649	20.2064 (87)
Th 2	20.0242	20.0259	20.0275	20.0353	20.0367	20.0434	20.0434	20.0447	20.0408	20.0367	20.0338	20.0307 (88)
util rest of house	0.9863	0.9704	0.9415	0.8689	0.7295	0.5194	0.3464	0.3792	0.6155	0.8775	0.9697	0.9890 (89)
MIT 2	19.6120	19.1932	19.4277	19.7002	19.8780	19.9553	19.9654	19.9661	19.9373	19.7296	19.3245	19.1511 (90)
Living area fraction									fLA = Living area / (4) =			0.1364 (91)
MIT	19.7390	19.3397	19.5678	19.8335	20.0093	20.0869	20.0979	20.0982	20.0684	19.8616	19.4663	19.2950 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7390	19.3397	19.5678	19.8335	20.0093	20.0869	20.0979	20.0982	20.0684	19.8616	19.4663	19.2950 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9852	0.9646	0.9341	0.8621	0.7278	0.5233	0.3518	0.3846	0.6179	0.8708	0.9640	0.9866 (94)
Useful gains	759.0169	863.7898	898.1174	875.4019	752.4432	527.7802	341.7626	360.2723	563.6302	730.9483	739.5244	724.6521 (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	1546.6662	1443.8100	1304.1944	1081.5954	820.6333	537.7013	342.7818	361.8952	586.6387	914.6870	1225.4176	1501.0444 (97)
Space heating kWh	586.0111	389.7736	302.1213	148.4594	50.7335	0.0000	0.0000	0.0000	0.0000	136.7016	349.8431	577.6359 (98a)
Space heating requirement - total per year (kWh/year)												2541.2794
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	586.0111	389.7736	302.1213	148.4594	50.7335	0.0000	0.0000	0.0000	0.0000	136.7016	349.8431	577.6359 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2541.2794
Space heating per m2										(98c) / (4) =		27.1795 (99)

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

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

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

279.0938 (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	586.0111	389.7736	302.1213	148.4594	50.7335	0.0000	0.0000	0.0000	0.0000	136.7016	349.8431	577.6359 (98)
Space heating efficiency (main heating system 1)	279.0938	279.0938	279.0938	279.0938	279.0938	0.0000	0.0000	0.0000	0.0000	279.0938	279.0938	279.0938 (210)
Space heating fuel (main heating system)	209.9693	139.6569	108.2508	53.1934	18.1779	0.0000	0.0000	0.0000	0.0000	48.9805	125.3497	206.9684 (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	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746 (64)
Efficiency of water heater (217)m	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709 (216)
Fuel for water heating, kWh/month	177.0704	156.5793	166.0069	144.8113	139.6690	125.0544	122.6920	127.9139	129.7331	145.6480	156.1209	174.9578 (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	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910 (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												910.5468 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.3709
Water heating fuel used												1766.2570 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	183.6736 (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	2860.4774 (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	910.5468	0.1565	142.4636 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1766.2570	0.1411	249.1382 (264)
Space and water heating			391.6018 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	183.6736	0.1443	26.5098 (268)
Total CO2, kg/year			418.1116 (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	910.5468	1.5792	1437.9367 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1766.2570	1.5216	2687.4935 (278)
Space and water heating			4125.4302 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	183.6736	1.5338	281.7247 (282)
Total Primary energy kWh/year			4407.1549 (286)
Dwelling Primary energy Rate (DPER)			47.1400 (287)

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

1. Overall dwelling characteristics

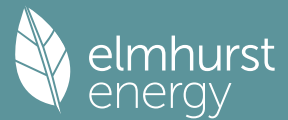
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (5)

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) = 0.1258 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3758 (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) = 0.3195 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3195	0.3434	0.3594	0.3754 (22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704 (25)

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3. Heat losses and heat loss parameter

Element	Gross 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	
TER Opaque door			2.2360	1.0000	2.2400			(26)
TER Opening Type (Uw = 1.20)			20.2500	1.1450	23.1870			(27)
Heat Loss Floor 1			46.7500	0.1300	6.0775			(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1800	13.7797			(29a)
Joist	46.7500		46.7500	0.1100	5.1425			(30)
Total net area of external elements Aum(A, m ²)			192.5440					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4267			(33)
Party Wall			44.9800	0.0000	0.0000			(32)

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

235.9764 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320	
E3 Sill	4.9000	0.0500	0.2450	
E4 Jamb	54.7600	0.0500	2.7380	
E5 Ground floor (normal)	19.4200	0.1600	3.1072	
E6 Intermediate floor within a dwelling	19.4200	0.0000	0.0000	
E16 Corner (normal)	10.2000	0.0900	0.9180	
E18 Party wall between dwellings	10.2000	0.0600	0.6120	
E25 Staggered party wall between dwellings	2.4000	0.0600	0.1440	
P1 Party wall - Ground floor	8.8200	0.0800	0.7056	
E10 Eaves (insulation at ceiling level)	10.6000	0.0600	0.6360	
E12 Gable (insulation at ceiling level)	8.8200	0.0600	0.5292	
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.1200	1.0584	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.2254 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	61.6521 (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	45.8664	45.6130	45.3646	44.1978	43.9795	42.9633	42.9633	42.7752	43.3548	43.9795	44.4212	44.8828	(38)
Heat transfer coeff	107.5186	107.2651	107.0167	105.8500	105.6317	104.6155	104.6155	104.4273	105.0069	105.6317	106.0733	106.5350	(39)
Average = Sum(39)m / 12 =												105.8489	
HLP	1.1499	1.1472	1.1446	1.1321	1.1298	1.1189	1.1189	1.1169	1.1231	1.1298	1.1345	1.1394	(40)
HLP (average)												1.1321	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

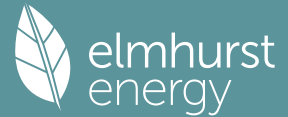
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6707 (42)
Hot water usage for mixer showers	68.9980	67.9611	66.4501	63.5591	61.4257	59.0464	57.6941	59.1936	60.8374	63.3920	66.3450	68.7336	(42a)
Hot water usage for baths	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939	(42b)
Hot water usage for other uses	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802	(42c)
Average daily hot water use (litres/day)												129.4020	(43)
Daily hot water use	140.7728	137.7669	134.1062	128.5398	124.0195	119.1597	117.2921	120.9370	124.7810	129.8829	135.5351	140.4078	(44)
Energy conte	222.9498	196.1782	206.1163	175.9645	166.9540	146.5208	141.8547	149.7452	153.8675	176.2499	193.0946	219.8446	(45)
Energy content (annual)										Total = Sum(45)m =		2149.3401	
Distribution loss (46)m = 0.15 x (45)m	33.4425	29.4267	30.9174	26.3947	25.0431	21.9781	21.2782	22.4618	23.0801	26.4375	28.9642	32.9767	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	269.5447	238.2639	252.7112	221.0564	213.5489	191.6126	188.4496	196.3401	198.9593	222.8448	238.1864	266.4395	(62)
WVHRS	-31.5430	-27.8969	-29.2120	-24.1887	-22.5430	-19.2902	-18.0815	-19.2279	-19.9584	-23.5287	-26.6552	-30.9589	(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	238.0017	210.3670	223.4992	196.8677	191.0059	172.3224	170.3681	177.1123	179.0009	199.3160	211.5312	235.4806	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2404.8731	(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	111.4067	98.8978	105.8096	94.5817	92.7881	84.7916	84.4426	87.0662	87.2344	95.8790	100.2774	110.3743	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8795	137.1523	123.8795	128.0088	123.8795	128.0088	123.8795	123.8795	128.0088	123.8795	128.0088	123.8795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	(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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)	149.7402	147.1694	142.2172	131.3634	124.7152	117.7662	113.4981	117.0245	121.1589	128.8696	139.2742	148.3525	(72)

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Total internal gains
585.0511 598.2993 573.6580 553.2740 525.2537 503.2282 484.0044 484.9846 499.6646 519.9056 551.6822 572.8370 (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					7.0200	10.6334	0.6300	0.7000	0.7700		22.8129 (74)	
South					13.2300	46.7521	0.6300	0.7000	0.7700		189.0308 (78)	
Solar gains	211.8437	353.1803	468.4360	564.7000	624.7490	618.5743	596.9316	551.2232	501.0198	385.8111	252.2086	182.3579 (83)
Total gains	796.8948	951.4796	1042.0940	1117.9740	1150.0027	1121.8026	1080.9360	1036.2077	1000.6844	905.7167	803.8908	755.1949 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.0025	57.1372	57.2698	57.9011	58.0208	58.5844	58.5844	58.6899	58.3660	58.0208	57.7792	57.5288
alpha	4.8002	4.8091	4.8180	4.8601	4.8681	4.9056	4.9056	4.9127	4.8911	4.8681	4.8519	4.8353
util living area	0.9886	0.9736	0.9465	0.8805	0.7584	0.5768	0.4221	0.4578	0.6756	0.8988	0.9753	0.9910 (86)
MIT	19.7910	20.0390	20.3210	20.6431	20.8672	20.9728	20.9951	20.9928	20.9416	20.6574	20.1693	19.7482 (87)
Th 2	19.9603	19.9625	19.9646	19.9747	19.9766	19.9854	19.9854	19.9871	19.9820	19.9766	19.9728	19.9688 (88)
util rest of house	0.9853	0.9662	0.9315	0.8484	0.7002	0.4936	0.3267	0.3599	0.5935	0.8644	0.9671	0.9884 (89)
MIT 2	18.5769	18.8899	19.2400	19.6291	19.8700	19.9704	19.9839	19.9846	19.9454	19.6559	19.0648	18.5288 (90)
Living area fraction									fLA = Living area / (4) =			0.1364 (91)
MIT	18.7425	19.0466	19.3874	19.7673	20.0060	20.1071	20.1218	20.1221	20.0812	19.7925	19.2154	18.6951 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7425	19.0466	19.3874	19.7673	20.0060	20.1071	20.1218	20.1221	20.0812	19.7925	19.2154	18.6951 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9798	0.9577	0.9212	0.8410	0.7020	0.5039	0.3397	0.3732	0.6020	0.8571	0.9589	0.9837 (94)
Useful gains	780.7810	911.2025	960.0077	940.1670	807.3433	565.2501	367.1948	386.7137	602.4572	776.3028	770.8646	742.8612 (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	1552.8340	1517.4404	1379.1684	1150.3076	877.3727	576.1249	368.4336	388.6846	628.0682	971.0154	1285.1246	1544.2309 (97)
Space heating kWh	574.4075	407.3919	311.8556	151.3012	52.1018	0.0000	0.0000	0.0000	0.0000	144.8662	370.2672	596.2190 (98a)
Space heating requirement - total per year (kWh/year)												2608.4104
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	574.4075	407.3919	311.8556	151.3012	52.1018	0.0000	0.0000	0.0000	0.0000	144.8662	370.2672	596.2190 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2608.4104
Space heating per m2										(98c) / (4) =		27.8974 (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	574.4075	407.3919	311.8556	151.3012	52.1018	0.0000	0.0000	0.0000	0.0000	144.8662	370.2672	596.2190 (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)	622.3266	441.3780	337.8717	163.9233	56.4484	0.0000	0.0000	0.0000	0.0000	156.9514	401.1563	645.9578 (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	238.0017	210.3670	223.4992	196.8677	191.0059	172.3224	170.3681	177.1123	179.0009	199.3160	211.5312	235.4806 (64)
Efficiency of water heater	85.9599	85.5157	84.8069	83.4766	81.5718	79.8000	79.8000	79.8000	79.8000	83.3559	85.3021	79.8000 (216)
Fuel for water heating, kWh/month	276.8754	245.9982	263.5388	235.8358	234.1567	215.9429	213.4938	221.9452	224.3119	239.1146	247.9788	273.6487 (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	25.7397	20.6493	18.5924	13.6216	10.5217	8.5963	9.5983	12.4762	16.2054	21.2623	24.0157	26.4551 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-43.0210	-60.2904	-86.1512	-96.2688	-103.2916	-96.1990	-94.9675	-89.8739	-80.8534	-68.6110	-47.1506	-37.2332 (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)	-25.4302	-53.3610	-105.8225	-158.6136	-209.4352	-210.3562	-207.9205	-176.2169	-129.3620	-76.2521	-33.9305	-20.1234 (233b)

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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													2826.0134	(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													2892.8408	(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)													207.7342	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2310.7359	(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													3701.8525	(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	2826.0134	0.2100	593.4628 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2892.8408	0.2100	607.4966 (264)
Space and water heating			1200.9594 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	207.7342	0.1443	29.9825 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-903.9116	0.1347	-121.7761
PV Unit electricity exported	-1406.8242	0.1260	-177.1927
Total			-298.9687 (269)
Total CO2, kg/year			943.9024 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2826.0134	1.1300	3193.3952 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2892.8408	1.1300	3268.9101 (278)
Space and water heating			6462.3053 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	207.7342	1.5338	318.6296 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-903.9116	1.4979	-1353.9822
PV Unit electricity exported	-1406.8242	0.4623	-650.4222
Total			-2004.4044 (283)
Total Primary energy kWh/year			4906.6313 (286)
Target Primary Energy Rate (TPER)			52.4800 (287)

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

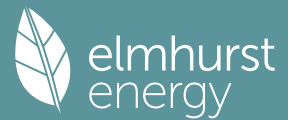
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	93.5000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	238.4250 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	30.0000 / (5) =	0.1258 (8)
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50												4.0000	(17)	
Infiltration rate												0.3258	(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) =											0.2770	(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)	
	0.3531	0.3462	0.3393	0.3046	0.2977	0.2631	0.2631	0.2562	0.2770	0.2977	0.3116	0.3254	(22b)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)	
Effective ac	0.5623	0.5599	0.5576	0.5464	0.5443	0.5346	0.5346	0.5328	0.5384	0.5443	0.5485	0.5529	(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	
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000	(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800	(29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500	(30)
Total net area of external elements Aum(A, m2)			192.5440					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.7053			(33)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000	(32)
GF			92.6800			75.0000	6951.0000	(32c)
FF			100.4900			9.0000	904.4100	(32c)
Internal Floor 1			46.7500			18.0000	841.5000	(32d)
Internal Ceiling 1			46.7500			9.0000	420.7500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22063.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 235.9764 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.6400	0.0260	0.2766	
E3 Sill	4.9000	0.0230	0.1127	
E4 Jamb	54.7600	0.0180	0.9857	
E5 Ground floor (normal)	19.4200	0.0680	1.3206	
E6 Intermediate floor within a dwelling	19.4200	0.0010	0.0194	
E16 Corner (normal)	10.2000	0.0400	0.4080	
E18 Party wall between dwellings	10.2000	0.0320	0.3264	
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672	
P1 Party wall - Ground floor	8.8200	0.0580	0.5116	
E10 Eaves (insulation at ceiling level)	10.6000	0.0550	0.5830	
E12 Gable (insulation at ceiling level)	8.8200	0.0370	0.3263	
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.0330	0.2911	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2286	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	55.9338 (37)

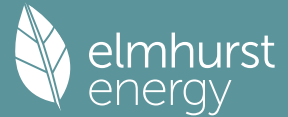
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Jan 44.2454 Feb 44.0549 Mar 43.8682 Apr 42.9913 May 42.8272 Jun 42.0634 Jul 42.0634 Aug 41.9220 Sep 42.3576 Oct 42.8272 Nov 43.1591 Dec 43.5061 (38)
Heat transfer coeff 100.1793 99.9888 99.8021 98.9251 98.7610 97.9972 97.9972 97.8558 98.2914 98.7610 99.0930 99.4400 (39)
Average = Sum(39)m / 12 = 98.9243

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.0714	1.0694	1.0674	1.0580	1.0563	1.0481	1.0481	1.0466	1.0512	1.0563	1.0598	1.0635	(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												2.6707 (42)	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)	
Hot water usage for baths	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939 (42b)	
Hot water usage for other uses	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802 (42c)	
Average daily hot water use (litres/day)												65.7882 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	71.7749	69.8058	67.6561	64.9807	62.5938	60.1133	59.5980	61.7434	63.9436	66.4909	69.1901	71.6741 (44)	
Distribution loss (46)m = 0.15 x (45)m	113.6738	99.4025	103.9850	88.9553	84.2633	73.9163	72.0787	76.4512	78.8489	90.2276	98.5739	112.2244 (45)	
Total = Sum(45)m =												1092.6008	
Water 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)	
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	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	96.6228	84.4922	88.3872	75.6120	71.6238	62.8289	61.2669	64.9835	67.0216	76.6934	83.7878	95.3907 (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	96.6228	84.4922	88.3872	75.6120	71.6238	62.8289	61.2669	64.9835	67.0216	76.6934	83.7878	95.3907 (64)	
Total per year (kWh/year) = Sum(64)m =												928.7107 (64)	

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12Total per year (kWh/year)	929 (64)										
Electric shower(s)	55.2559	49.2334	53.7610	51.3035	52.2662	49.8569	51.5188	52.2662	51.3035	53.7610	52.7501
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =										
Heat gains from water heating, kWh/month	37.9697	33.4314	35.5371	31.7289	30.9725	28.1714	28.1964	29.3124	29.5813	32.6136	34.1345
	628.5324 (64a)										
	37.6616 (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	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8795	137.1523	123.8795	128.0088	123.8795	128.0088	123.8795	123.8795	128.0088	123.8795	128.0088	123.8795 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533 (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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265 (71)
Water heating gains (Table 5)	51.0345	49.7491	47.7649	44.0679	41.6297	39.1270	37.8984	39.3984	41.0851	43.8355	47.4090	50.6205 (72)
Total internal gains	483.3454	497.8790	476.2057	462.9784	439.1682	424.5890	408.4047	407.3585	419.5908	431.8715	456.8171	472.1050 (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				7.0200	10.6334	0.5000	0.7000	0.7700			18.1055 (74)	
South				13.2300	46.7521	0.5000	0.7000	0.7700			150.0244 (78)	
Solar gains	168.1299	280.3018	371.7746	448.1746	495.8325	490.9320	473.7553	437.4787	397.6348	306.1993	200.1655	144.7285 (83)
Total gains	651.4753	778.1809	847.9803	911.1531	935.0007	915.5211	882.1599	844.8372	817.2256	738.0708	656.9826	616.8335 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.1786	61.2952	61.4099	61.9542	62.0572	62.5408	62.5408	62.6312	62.3537	62.0572	61.8493	61.6335
alpha	5.0786	5.0863	5.0940	5.1303	5.1371	5.1694	5.1694	5.1754	5.1569	5.1371	5.1233	5.1089
util living area	0.9949	0.9870	0.9717	0.9275	0.8295	0.6512	0.4825	0.5230	0.7508	0.9407	0.9881	0.9961 (86)
MIT	19.7518	19.9744	20.2405	20.5703	20.8255	20.9621	20.9933	20.9899	20.9210	20.5934	20.1111	19.7117 (87)
Th 2	20.0242	20.0259	20.0275	20.0353	20.0367	20.0434	20.0434	20.0447	20.0408	20.0367	20.0338	20.0307 (88)
util rest of house	0.9933	0.9832	0.9630	0.9050	0.7796	0.5672	0.3809	0.4193	0.6733	0.9175	0.9838	0.9949 (89)
MIT 2	18.8939	19.1153	19.3773	19.6971	19.9214	20.0261	20.0417	20.0418	19.9996	19.7255	19.2583	18.8591 (90)
Living area fraction	19.0109	19.2325	19.4950	19.8162	20.0447	20.1538	20.1714	20.1711	20.1253	19.8438	19.3746	0.1364 (91)
MIT	19.0109	19.2325	19.4950	19.8162	20.0447	20.1538	20.1714	20.1711	20.1253	19.8438	19.3746	18.9754 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0109	19.2325	19.4950	19.8162	20.0447	20.1538	20.1714	20.1711	20.1253	19.8438	19.3746	18.9754 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9911	0.9790	0.9570	0.8990	0.7801	0.5774	0.3947	0.4334	0.6807	0.9118	0.9799	0.9931 (94)
Ext temp.	645.6798	761.8571	811.5419	819.1278	729.3489	528.6174	348.2095	366.1453	556.3016	673.0008	643.8050	612.5658 (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	1473.7233	1433.0885	1296.9312	1079.8839	824.1268	544.2540	349.9900	369.0202	592.2330	912.9317	1216.3264	1469.2617 (97)
Space heating requirement - total per year (kWh/year)	616.0643	451.0675	361.1296	187.7444	70.5148	0.0000	0.0000	0.0000	0.0000	178.5086	412.2154	637.3817 (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)	616.0643	451.0675	361.1296	187.7444	70.5148	0.0000	0.0000	0.0000	0.0000	178.5086	412.2154	637.3817 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2914.6263
Space heating per m2	(98c) / (4) =											31.1725 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	921.1741	725.1796	743.7041	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8778	0.9361	0.9197	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	808.5859	678.8078	683.9556	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1021.0298	984.4385	943.2487	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	152.9596	227.3892	192.9141	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.2399	56.8473	48.2285	0.0000	0.0000	0.0000	0.0000 (107)

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Space cooling requirement	143.3157 (107)
Energy for space heating	31.1725 (99)
Energy for space cooling	1.5328 (108)
Total	32.7053 (109)
Fabric Energy Efficiency (DFEE)	32.7 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (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) =	0.1258 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3758	(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) =		0.3195 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3195	0.3434	0.3594	0.3754 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704 (25)

3. Heat losses and heat loss parameter

Element	Gross 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
TER Opaque door			2.2360	1.0000	2.2400		(26)
TER Opening Type (Uw = 1.20)			20.2500	1.1450	23.1870		(27)
Heat Loss Floor 1			46.7500	0.1300	6.0775		(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1800	13.7797		(29a)
Joist	46.7500		46.7500	0.1100	5.1425		(30)
Total net area of external elements Aum(A, m ²)			192.5440				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	50.4267	(33)
Party Wall			44.9800	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 235.9764 (35)

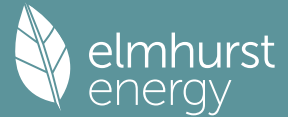
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E3 Sill	4.9000	0.0500	0.2450
E4 Jamb	54.7600	0.0500	2.7380
E5 Ground floor (normal)	19.4200	0.1600	3.1072
E6 Intermediate floor within a dwelling	19.4200	0.0000	0.0000
E16 Corner (normal)	10.2000	0.0900	0.9180
E18 Party wall between dwellings	10.2000	0.0600	0.6120
E25 Staggered party wall between dwellings	2.4000	0.0600	0.1440
P1 Party wall - Ground floor	8.8200	0.0800	0.7056
E10 Eaves (insulation at ceiling level)	10.6000	0.0600	0.6360
E12 Gable (insulation at ceiling level)	8.8200	0.0600	0.5292
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.1200	1.0584

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.2254 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.6521 (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	45.8664	45.6130	45.3646	44.1978	43.9795	42.9633	42.9633	42.7752	43.3548	43.9795	44.4212	44.8828 (38)
Average = Sum(39)m / 12 =	107.5186	107.2651	107.0167	105.8500	105.6317	104.6155	104.6155	104.4273	105.0069	105.6317	106.0733	106.5350 (39)
												105.8489

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1499	1.1472	1.1446	1.1321	1.1298	1.1189	1.1189	1.1169	1.1231	1.1298	1.1345	1.1394	(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													2.6707 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939	29.6939	(42b)
Hot water usage for other uses													
41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802	41.9802	(42c)
Average daily hot water use (litres/day)													65.7882 (43)
Daily hot water use													
71.7749	69.8058	67.6561	64.9807	62.5938	60.1133	59.5980	61.7434	63.9436	66.4909	69.1901	71.6741	71.6741	(44)
Energy conte	113.6738	99.4025	103.9850	88.9553	84.2633	73.9163	72.0787	76.4512	78.8489	90.2276	98.5739	112.2244	(45)
Energy content (annual)										Total = Sum(45)m =	1092.6008	1092.6008	
Distribution loss (46)m = 0.15 x (45)m													
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	(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	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	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													
96.6228	84.4922	88.3872	75.6120	71.6238	62.8289	61.2669	64.9835	67.0216	76.6934	83.7878	95.3907	95.3907	(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													
96.6228	84.4922	88.3872	75.6120	71.6238	62.8289	61.2669	64.9835	67.0216	76.6934	83.7878	95.3907	95.3907	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	929	929	(64)
Electric shower(s)													
55.2559	49.2334	53.7610	51.3035	52.2662	49.8569	51.5188	52.2662	51.3035	53.7610	52.7501	55.2559	55.2559	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												628.5324	(64a)
Heat gains from water heating, kWh/month													
37.9697	33.4314	35.5371	31.7289	30.9725	28.1714	28.1964	29.3124	29.5813	32.6136	34.1345	37.6616	37.6616	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
123.8795	137.1523	123.8795	128.0088	123.8795	128.0088	123.8795	123.8795	128.0088	123.8795	128.0088	123.8795	123.8795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451	234.5451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	(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)													
-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)													
51.0345	49.7491	47.7649	44.0679	41.6297	39.1270	37.8984	39.3984	41.0851	43.8355	47.4090	50.6205	50.6205	(72)
Total internal gains													
483.3454	497.8790	476.2057	462.9784	439.1682	424.5890	408.4047	407.3585	419.5908	431.8715	456.8171	472.1050	472.1050	(73)

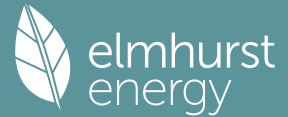
6. Solar gains

[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				7.0200	10.6334		0.6300		0.7000		0.7700	22.8129 (74)
South				13.2300	46.7521		0.6300		0.7000		0.7700	189.0308 (78)
Solar gains	211.8437	353.1803	468.4360	564.7000	624.7490	618.5743	596.9316	551.2232	501.0198	385.8111	252.2086	182.3579 (83)
Total gains	695.1891	851.0593	944.6417	1027.6785	1063.9172	1043.1634	1005.3363	958.5817	920.6106	817.6826	709.0256	654.4629 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.0025	57.1372	57.2698	57.9011	58.0208	58.5844	58.5844	58.6899	58.3660	58.0208	57.7792	57.5288	
alpha	4.8002	4.8091	4.8180	4.8601	4.8681	4.9056	4.9056	4.9127	4.8911	4.8681	4.8519	4.8353	
util living area	0.9935	0.9828	0.9621	0.9065	0.7949	0.6137	0.4524	0.4926	0.7183	0.9262	0.9849	0.9951 (86)	
MIT	19.6745	19.9311	20.2279	20.5796	20.8354	20.9645	20.9934	20.9901	20.9237	20.5891	20.0662	19.6313 (87)	
Th 2	19.9603	19.9625	19.9646	19.9747	19.9766	19.9854	19.9854	19.9871	19.9820	19.9766	19.9728	19.9688 (88)	
util rest of house	0.9915	0.9778	0.9507	0.8790	0.7394	0.5277	0.3509	0.3884	0.6363	0.8984	0.9796	0.9936 (89)	
MIT 2	18.7672	19.0220	19.3127	19.6510	19.8711	19.9698	19.9838	19.9843	19.9436	19.6685	19.1655	18.7310 (90)	
Living area fraction									fLA = Living area / (4) =				0.1364 (91)
MIT	18.8909	19.1459	19.4375	19.7776	20.0026	20.1054	20.1215	20.1215	20.0772	19.7940	19.2883	18.8538 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.8909	19.1459	19.4375	19.7776	20.0026	20.1054	20.1215	20.1215	20.0772	19.7940	19.2883	18.8538 (93)	

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9887	0.9725	0.9435	0.8728	0.7409	0.5383	0.3648	0.4025	0.6446	0.8924	0.9748	0.9913	(94)
Useful gains	687.3357	827.6858	891.3011	896.9939	788.3086	561.5244	366.6991	385.8741	593.3881	729.6827	691.1321	648.7476	(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	1568.7951	1528.0919	1384.5290	1151.3950	877.0169	575.9550	368.3990	388.6257	627.6504	971.1787	1292.8539	1561.1389	(97)
Space heating kWh	655.8058	470.6729	366.9616	183.1688	65.9989	0.0000	0.0000	0.0000	0.0000	179.6730	433.2397	678.8192	(98a)
Space heating requirement - total per year (kWh/year)												3034.3398	
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	655.8058	470.6729	366.9616	183.1688	65.9989	0.0000	0.0000	0.0000	0.0000	179.6730	433.2397	678.8192	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3034.3398	
Space heating per m2										(98c) / (4) =		32.4528	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	983.3855	774.1546	793.6474	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8941	0.9446	0.9296	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	879.2070	731.2423	737.7399	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1170.2221	1128.4109	1076.1968	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	209.5309	295.4934	251.8119	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.3827	73.8733	62.9530	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												189.2091	(107)
Energy for space heating												32.4528	(99)
Energy for space cooling												2.0236	(108)
Total												34.4765	(109)
Fabric Energy Efficiency (TFEE)												34.5	(109)

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

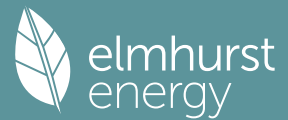
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)	
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	238.4250 (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) =	0.1258 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												4.0000	(17)
Infiltration rate												0.3258	(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) =	0.2770 (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)
	0.3531	0.3462	0.3393	0.3046	0.2977	0.2631	0.2631	0.2562	0.2770	0.2977	0.3116	0.3254	(22b)
Effective ac	0.5623	0.5599	0.5576	0.5464	0.5443	0.5346	0.5346	0.5328	0.5384	0.5443	0.5485	0.5529	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000	(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800	(29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500	(30)
Total net area of external elements Aum(A, m2)			192.5440					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.7053			(33)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000	(32)
GF			92.6800			75.0000	6951.0000	(32c)
FF			100.4900			9.0000	904.4100	(32c)
Internal Floor 1			46.7500			18.0000	841.5000	(32d)
Internal Ceiling 1			46.7500			9.0000	420.7500	(32e)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 22063.7900 (34)

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

235.9764 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6400	0.0260	0.2766
E3 Sill	4.9000	0.0230	0.1127
E4 Jamb	54.7600	0.0180	0.9857
E5 Ground floor (normal)	19.4200	0.0680	1.3206
E6 Intermediate floor within a dwelling	19.4200	0.0010	0.0194
E16 Corner (normal)	10.2000	0.0400	0.4080
E18 Party wall between dwellings	10.2000	0.0320	0.3264
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672
P1 Party wall - Ground floor	8.8200	0.0580	0.5116
E10 Eaves (insulation at ceiling level)	10.6000	0.0550	0.5830
E12 Gable (insulation at ceiling level)	8.8200	0.0370	0.3263
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.0330	0.2911

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

5.2286 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 55.9338 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.2454	44.0549	43.8682	42.9913	42.8272	42.0634	42.0634	41.9220	42.3576	42.8272	43.1591	43.5061	(38)
Heat transfer coeff	100.1793	99.9888	99.8021	98.9251	98.7610	97.9972	97.9972	97.8558	98.2914	98.7610	99.0930	99.4400	(39)
Average = Sum(39)m / 12 =												98.9243	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0714	1.0694	1.0674	1.0580	1.0563	1.0481	1.0481	1.0466	1.0512	1.0563	1.0598	1.0635	(40)
HLP (average)												1.0580	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

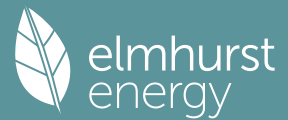
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6707 (42)
Hot water usage for mixer showers													
94.8722	93.4465	91.3689	87.3938	84.4603	81.1888	79.3294	81.3912	83.6514	87.1639	91.2244	94.5087	94.5087	(42a)
Hot water usage for baths													
29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939	29.6939	(42b)
Hot water usage for other uses													
41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802	41.9802	(42c)
Average daily hot water use (litres/day)													153.2572 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	166.6471	163.2523	159.0250	152.3745	147.0541	141.3022	138.9274	143.1346	147.5950	153.6549	160.4145	166.1829	(44)
Energy conte	263.9282	232.4691	244.4155	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022	(45)
Energy content (annual)										Total = Sum(45)m =		2545.6173	
Distribution loss (46)m = 0.15 x (45)m													
39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303	39.0303	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8100 (55)
Total storage loss													
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	(56)
If cylinder contains dedicated solar storage													
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	(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	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													
312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746	308.5746	(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													
312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746	308.5746	(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	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													
126.4541	112.2489	119.9661	106.8068	104.5206	95.2206	94.5648	97.6271	97.9644	108.0269	113.4391	125.2152	125.2152	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
26.0009	23.0938	18.7811	14.2185	10.6285	8.9730	9.6957	12.6028	16.9155	21.4781	25.0681	26.7235	26.7235	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
366.2262	370.0265	360.4499	340.0625	314.3270	290.1393	273.9804	270.1801	279.7567	300.1442	325.8796	350.0673	350.0673	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

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Pumps, fans	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265 (71)
Water heating gains (Table 5)	169.9651	167.0371	161.2447	148.3427	140.4847	132.2509	127.1032	131.2192	136.0617	145.1974	157.5543	168.2999	168.2999 (72)
Total internal gains	669.3001	667.2652	647.5836	609.7316	572.5481	538.4711	517.8872	521.1100	539.8417	573.9275	615.6098	652.1987	652.1987 (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					7.0200	10.6334	0.5000	0.7000			0.7700			18.1055 (74)
South					13.2300	46.7521	0.5000	0.7000			0.7700			150.0244 (78)
Solar gains	168.1299	280.3018	371.7746	448.1746	495.8325	490.9320	473.7553	437.4787	397.6348	306.1993	200.1655			144.7285 (83)
Total gains	837.4300	947.5670	1019.3582	1057.9062	1068.3806	1029.4031	991.6424	958.5887	937.4765	880.1268	815.7754			796.9272 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.1786	61.2952	61.4099	61.9542	62.0572	62.5408	62.5408	62.6312	62.3537	62.0572	61.8493	61.6335	
alpha	5.0786	5.0863	5.0940	5.1303	5.1371	5.1694	5.1694	5.1754	5.1569	5.1371	5.1233	5.1089	
util living area	0.9849	0.9711	0.9437	0.8839	0.7679	0.5900	0.4315	0.4646	0.6798	0.8943	0.9710	0.9880	(86)
Living	20.1642	20.3089	20.4957	20.6997	20.8499	20.9218	20.9370	20.9357	20.9024	20.7198	20.4037	20.1313	
Non living	19.0622	19.2446	19.4761	19.7241	19.8863	19.9562	19.9655	19.9663	19.9399	19.7535	19.3722	19.0260	
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	20.5724	20.3089	20.4957	20.6997	20.8499	20.9218	20.9370	20.9357	20.9024	20.7198	20.4037	20.2528	(87)
Th 2	20.0242	20.0259	20.0275	20.0353	20.0367	20.0434	20.0434	20.0447	20.0408	20.0367	20.0338	20.0307	(88)
util rest of house	0.9807	0.9632	0.9286	0.8533	0.7125	0.5097	0.3394	0.3707	0.6013	0.8600	0.9617	0.9845	(89)
MIT 2	19.6407	19.2446	19.4761	19.7241	19.8863	19.9562	19.9655	19.9663	19.9399	19.7535	19.3722	19.2070	(90)
Living area fraction	19.7677	19.3897	19.6152	19.8571	20.0177	20.0879	20.0980	20.0985	20.0711	19.8853	19.5128	19.3496	(91)
MIT	19.7677	19.3897	19.6152	19.8571	20.0177	20.0879	20.0980	20.0985	20.0711	19.8853	19.5128	19.3496	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7677	19.3897	19.6152	19.8571	20.0177	20.0879	20.0980	20.0985	20.0711	19.8853	19.5128	19.3496	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	820.1139	906.6606	938.6794	895.9130	760.0043	528.6780	341.8680	360.4561	566.1375	751.4068	779.3121	782.1165	(94)
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	(95)
Heat loss rate W	1549.5469	1448.8062	1308.9210	1083.9361	821.4672	537.7990	342.7942	361.9164	586.9122	917.0262	1230.0228	1506.4782	(97)
Space heating kWh	542.6981	364.3219	275.4597	135.3766	45.7284	0.0000	0.0000	0.0000	0.0000	123.2208	324.5117	538.9251	(98a)
Space heating requirement - total per year (kWh/year)												2350.2423	
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	542.6981	364.3219	275.4597	135.3766	45.7284	0.0000	0.0000	0.0000	0.0000	123.2208	324.5117	538.9251	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2350.2423	
Space heating per m2										(98c) / (4) =		25.1363	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Efficiency of main space heating system 1 (in %)												279.0938 (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	542.6981	364.3219	275.4597	135.3766	45.7284	0.0000	0.0000	0.0000	0.0000	123.2208	324.5117	538.9251	(98)
Space heating efficiency (main heating system 1)	279.0938	279.0938	279.0938	279.0938	279.0938	0.0000	0.0000	0.0000	0.0000	279.0938	279.0938	279.0938	(210)
Space heating fuel (main heating system)	194.4501	130.5374	98.6979	48.5058	16.3846	0.0000	0.0000	0.0000	0.0000	44.1503	116.2734	193.0982	(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	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746	(64)
Efficiency of water heater (217)m	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	(216)
Fuel for water heating, kWh/month	177.0704	156.5793	166.0069	144.8113	139.6690	125.0544	122.6920	127.9139	129.7331	145.6480	156.1209	174.9578	(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)

Full SAP Calculation Printout



Lighting	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910 (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												842.0978 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.3709
Water heating fuel used												1766.2570 (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)												183.6736 (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												2792.0284 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	842.0978	16.4900	138.8619 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1766.2570	16.4900	291.2558 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	183.6736	16.4900	30.2878 (250)
Additional standing charges			0.0000 (251)
Total energy cost			460.4055 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1967 (257)
SAP value		80.6011
SAP rating (Section 12)		81 (258)
SAP band		B

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

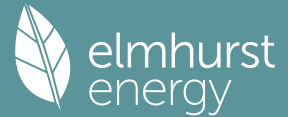
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	842.0978	0.1565	131.8180 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1766.2570	0.1411	249.1382 (264)
Space and water heating			380.9562 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	183.6736	0.1443	26.5098 (268)
Total CO2, kg/year			407.4659 (272)
CO2 emissions per m2			4.3600 (273)
EI value			96.0577
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	238.4250 (5)

Full SAP Calculation Printout



2. Ventilation rate

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate													
	0.2908	0.2770	0.2770	0.2562	0.2562	0.2285	0.2354	0.2216	0.2285	0.2423	0.2423	0.2631	(22b)
Effective ac	0.5423	0.5384	0.5384	0.5328	0.5328	0.5261	0.5277	0.5245	0.5261	0.5294	0.5294	0.5346	(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	
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000	(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800	(29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500	(30)
Total net area of external elements Aum(A, m2)			192.5440					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000	(32c)
GF			92.6800			75.0000	6951.0000	(32c)
FF			100.4900			9.0000	904.4100	(32c)
Internal Floor 1			46.7500			18.0000	841.5000	(32d)
Internal Ceiling 1			46.7500			9.0000	420.7500	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 22063.7900 (34)
List of Thermal Bridges
235.9764 (35)

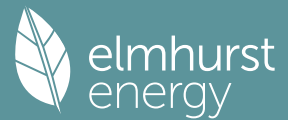
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.6400	0.0260	0.2766	
E3 Sill	4.9000	0.0230	0.1127	
E4 Jamb	54.7600	0.0180	0.9857	
E5 Ground floor (normal)	19.4200	0.0680	1.3206	
E6 Intermediate floor within a dwelling	19.4200	0.0010	0.0194	
E16 Corner (normal)	10.2000	0.0400	0.4080	
E18 Party wall between dwellings	10.2000	0.0320	0.3264	
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672	
P1 Party wall - Ground floor	8.8200	0.0580	0.5116	
E10 Eaves (insulation at ceiling level)	10.6000	0.0550	0.5830	
E12 Gable (insulation at ceiling level)	8.8200	0.0370	0.3263	
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.0330	0.2911	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2286	(36)
Point Thermal bridges			0.0000	(36a)
Total fabric heat loss			55.9338	(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	42.6669	42.3576	42.3576	41.9220	41.9220	41.3939	41.5203	41.2713	41.3939	41.6504	41.6504	42.0634	(38)
Average = Sum(39)m / 12 =	98.6007	98.2914	98.2914	97.8558	97.8558	97.3277	97.4541	97.2052	97.3277	97.5842	97.5842	97.9972	(39)
												97.7813	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0546	1.0512	1.0512	1.0466	1.0466	1.0409	1.0423	1.0396	1.0409	1.0437	1.0437	1.0481	(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													2.6707 (42)
Hot water usage for mixer showers													94.5087 (42a)
Hot water usage for baths													29.6939 (42b)
Hot water usage for other uses													41.9802 (42c)
Average daily hot water use (litres/day)													153.2572 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	166.6471	163.2523	159.0250	152.3745	147.0541	141.3022	138.9274	143.1346	147.5950	153.6549	160.4145	166.1829	(44)
Energy content (annual)	263.9282	232.4691	244.4155	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2545.6173
Water storage loss:	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303	(46)
Store volume													150.0000 (47)

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a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746 (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	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746 (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	126.4541	112.2489	119.9661	106.8068	104.5206	95.2206	94.5648	97.6271	97.9644	108.0269	113.4391	125.2152 (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	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0009	23.0938	18.7811	14.2185	10.6285	8.9730	9.6957	12.6028	16.9155	21.4781	25.0681	26.7235 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.2262	370.0265	360.4499	340.0625	314.3270	290.1393	273.9804	270.1801	279.7567	300.1442	325.8796	350.0673 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946 (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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265 (71)
Water heating gains (Table 5)	169.9651	167.0371	161.2447	148.3427	140.4847	132.2509	127.1032	131.2192	136.0617	145.1974	157.5543	168.2999 (72)
Total internal gains	669.3001	667.2652	647.5836	609.7316	572.5481	538.4711	517.8872	521.1100	539.8417	573.9275	615.6098	652.1987 (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				7.0200	11.9814	0.5000			0.7000	0.7700		20.4008 (74)
South				13.2300	50.9848	0.5000			0.7000	0.7700		163.6071 (78)
Solar gains	184.0079	275.8595	362.1068	452.8560	491.6865	522.7854	498.2960	467.6455	420.7022	321.8258	224.3586	156.9299 (83)
Total gains	853.3079	943.1247	1009.6904	1062.5875	1064.2346	1061.2564	1016.1832	988.7555	960.5439	895.7534	839.9684	809.1286 (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	62.1581	62.3537	62.3537	62.6312	62.6312	62.9711	62.8894	63.0505	62.9711	62.8055	62.8055	62.5408
alpha	5.1439	5.1569	5.1569	5.1754	5.1754	5.1981	5.1926	5.2034	5.1981	5.1870	5.1870	5.1694
util living area	0.9796	0.9653	0.9300	0.8471	0.6889	0.4542	0.2969	0.3141	0.5718	0.8482	0.9568	0.9835 (86)
Living	20.2690	20.3866	20.5752	20.7694	20.8945	20.9361	20.9400	20.9400	20.9264	20.7956	20.5133	20.2405
Non living	19.2058	19.3541	19.5839	19.8102	19.9354	19.9712	19.9716	19.9739	19.9657	19.8452	19.5184	19.1746
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	20.6261	20.3866	20.5752	20.7694	20.8945	20.9361	20.9400	20.9400	20.9264	20.7956	20.5133	20.3467 (87)
Th 2	20.0381	20.0408	20.0408	20.0447	20.0447	20.0494	20.0482	20.0504	20.0494	20.0471	20.0471	20.0434 (88)
util rest of house	0.9737	0.9557	0.9109	0.8083	0.6219	0.3700	0.2060	0.2212	0.4851	0.8016	0.9429	0.9786 (89)
MIT 2	19.7063	19.3541	19.5839	19.8102	19.9354	19.9712	19.9716	19.9739	19.9657	19.8452	19.5184	19.3311 (90)
Living area fraction									fLA = Living area / (4) =			0.1364 (91)
MIT	19.8317	19.4949	19.7191	19.9410	20.0662	20.1027	20.1037	20.1057	20.0967	19.9748	19.6541	19.4696 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8317	19.4949	19.7191	19.9410	20.0662	20.1027	20.1037	20.1057	20.0967	19.9748	19.6541	19.4696 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	829.5910	894.9531	912.0669	853.8635	663.5174	397.7593	214.7020	224.0459	470.2195	714.4708	786.1026	788.8368 (94)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1452.5590	1365.7481	1210.8614	982.5705	691.4685	399.3106	214.7549	224.1226	476.5866	817.2494	1137.2549	1408.1847 (97)
Space heating kWh	463.4883	316.3743	222.3031	92.6690	20.7956	0.0000	0.0000	0.0000	0.0000	76.4672	252.8297	460.7948 (98a)
Space heating requirement - total per year (kWh/year)												1905.7220
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	463.4883	316.3743	222.3031	92.6690	20.7956	0.0000	0.0000	0.0000	0.0000	76.4672	252.8297	460.7948 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1905.7220

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Space heating per m2

(98c) / (4) = 20.3821 (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 %)												278.6721 (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	463.4883	316.3743	222.3031	92.6690	20.7956	0.0000	0.0000	0.0000	0.0000	76.4672	252.8297	460.7948 (98)
Space heating efficiency (main heating system 1)	278.6721	278.6721	278.6721	278.6721	278.6721	0.0000	0.0000	0.0000	0.0000	278.6721	278.6721	278.6721 (210)
Space heating fuel (main heating system)	166.3203	113.5292	79.7723	33.2538	7.4624	0.0000	0.0000	0.0000	0.0000	27.4399	90.7266	165.3538 (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	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746 (64)
Efficiency of water heater	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306 (216)
Fuel for water heating, kWh/month	176.9102	156.4377	165.8568	144.6803	139.5427	124.9412	122.5811	127.7982	129.6158	145.5162	155.9797	174.7995 (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	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910 (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												683.8581 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.5306
Water heating fuel used												1764.6594 (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)												183.6736 (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												2632.1912 (238)

10a. Fuel costs - using BEDF prices (560)

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	683.8581	26.0600	178.2134 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1764.6594	26.0600	459.8703 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	183.6736	26.0600	47.8653 (250)
Additional standing charges			0.0000 (251)
Total energy cost			685.9490 (255)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	683.8581	0.1573	107.6046 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1764.6594	0.1411	248.9128 (264)
Space and water heating			356.5174 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	183.6736	0.1443	26.5098 (268)
Total CO2, kg/year			383.0272 (272)

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

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	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	683.8581	1.5825	1082.2039 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1764.6594	1.5216	2685.0627 (278)
Space and water heating			3767.2666 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	183.6736	1.5338	281.7247 (282)
Total Primary energy kWh/year			4048.9913 (286)

SAP 10 EPC IMPROVEMENTS

Be Green Act

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating			Recommended
U Solar photovoltaic panels			Recommended
V2 Wind turbine			Not applicable
Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.2	-£ 92	-44 kg (11.4%)
U Solar photovoltaic panels	+ 6.1	-£ 234	-121 kg (35.5%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£92	0.47 kg/m ²	B 83 A 96
Solar photovoltaic panels	£234	1.29 kg/m ²	B 89 A 98
Total Savings	£325	1.76 kg/m ²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 560 TEST (06 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£686	£594	£92
Space heating	£178	£199	-£21
Water heating	£460	£347	£113
Lighting	£48	£48	£0
Generated (PV)	-£0	-£234	£234
Total cost of fuels	£686	£360	£326
Total cost of uses	£686	£360	£326
Delivered energy	28 kWh/m ²	15 kWh/m ²	13 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m ²	4 kg/m ²	2 kg/m ²	2 kg/m ²
Primary energy	43 kWh/m ²	23 kWh/m ²	20 kWh/m ²

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

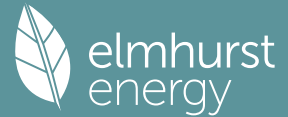
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (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)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1258 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3258 (18)

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Number of sides sheltered

2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.2770 \quad (21)$$

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	0.3531	0.3462	0.3393	0.3046	0.2977	0.2631	0.2631	0.2562	0.2770	0.2977	0.3116	0.3254 (22b)
Effective ac	0.5623	0.5599	0.5576	0.5464	0.5443	0.5346	0.5346	0.5328	0.5384	0.5443	0.5485	0.5529 (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	
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000	(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800	(29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500	(30)
Total net area of external elements Aum(A, m2)			192.5440					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.7053			(33)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000	(32)
GF			92.6800			75.0000	6951.0000	(32c)
FF			100.4900			9.0000	904.4100	(32c)
Internal Floor 1			46.7500			18.0000	841.5000	(32d)
Internal Ceiling 1			46.7500			9.0000	420.7500	(32e)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 22063.7900 \quad (34)$$

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

$$235.9764 \quad (35)$$

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	10.6400	0.0260	0.2766
E2 Other lintels (including other steel lintels)	4.9000	0.0230	0.1127
E3 Sill	54.7600	0.0180	0.9857
E4 Jamb	19.4200	0.0680	1.3206
E5 Ground floor (normal)	19.4200	0.0010	0.0194
E6 Intermediate floor within a dwelling	10.2000	0.0400	0.4080
E16 Corner (normal)	10.2000	0.0320	0.3264
E18 Party wall between dwellings	2.4000	0.0280	0.0672
E25 Staggered party wall between dwellings	8.8200	0.0580	0.5116
P1 Party wall - Ground floor	10.6000	0.0550	0.5830
E10 Eaves (insulation at ceiling level)	8.8200	0.0370	0.3263
E12 Gable (insulation at ceiling level)	8.8200	0.0330	0.2911
P4 Party wall - Roof (insulation at ceiling level)			

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

$$5.2286 \quad (36)$$

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 55.9338 \quad (37)$$

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

(38)m	Jan 44.2454	Feb 44.0549	Mar 43.8682	Apr 42.9913	May 42.8272	Jun 42.0634	Jul 42.0634	Aug 41.9220	Sep 42.3576	Oct 42.8272	Nov 43.1591	Dec 43.5061 (38)
Heat transfer coeff	100.1793	99.9888	99.8021	98.9251	98.7610	97.9972	97.9972	97.8558	98.2914	98.7610	99.0930	99.4400 (39)
Average = Sum(39)m / 12 =												98.9243

HLP	Jan 1.0714	Feb 1.0694	Mar 1.0674	Apr 1.0580	May 1.0563	Jun 1.0481	Jul 1.0481	Aug 1.0466	Sep 1.0512	Oct 1.0563	Nov 1.0598	Dec 1.0635 (40)
HLP (average)												1.0580
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6707 (42)
Hot water usage for mixer showers	94.8722	93.4465	91.3689	87.3938	84.4603	81.1888	79.3294	81.3912	83.6514	87.1639	91.2244	94.5087 (42a)
Hot water usage for baths	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939 (42b)
Hot water usage for other uses	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802 (42c)
Average daily hot water use (litres/day)												153.2572 (43)

Daily hot water use	Jan 166.6471	Feb 163.2523	Mar 159.0250	Apr 152.3745	May 147.0541	Jun 141.3022	Jul 138.9274	Aug 143.1346	Sep 147.5950	Oct 153.6549	Nov 160.4145	Dec 166.1829 (44)
Energy conte	263.9282	232.4691	25.1100	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022 (45)
Energy content (annual)										Total = Sum(45)m =		2545.6173
Distribution loss (46)m = 0.15 x (45)m	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303 (46)

Water storage loss:

Store volume

$$150.0000 \quad (47)$$

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

$$1.5000 \quad (48)$$

Temperature factor from Table 2b

$$0.5400 \quad (49)$$

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

$$0.8100 \quad (55)$$

Total storage loss

25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
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If cylinder contains dedicated solar storage

25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (57)
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Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
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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)
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Total heat required for water heating calculated for each month

312.3006	276.1603	291.3922	248.6514	233.5411	207.9528	203.3661	213.5065	223.4086	255.4849	275.3518	308.5746 (62)
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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)
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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)
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Aperture area of solar collector												3.0000 (H1)
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Zero-loss collector efficiency												0.8000 (H2)
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Collector linear heat loss coefficient												1.8000 (H3)
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Collector 2nd order heat loss coefficient												0.0000 (H4)
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Collector loop efficiency												0.9000 (H5)
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Incidence angle modifier												1.0000 (H6)
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Overshading factor												0.8000 (H8)
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Overall heat loss coefficient of system												6.5000 (H10)
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Heat loss coefficient of collector loop												3.9667 (H11)
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Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												639.9861	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												639.9861	
Solar input	-0.0000	-16.1804	-59.2987	-82.2833	-108.5306	-100.1363	-99.4150	-86.3779	-58.9557	-28.8082	-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	312.3006	259.9798	232.0935	166.3681	125.0105	107.8165	103.9512	127.1286	164.4529	226.6766	275.3518	308.5746	(64)
												2409.7048	(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	126.4541	112.2489	118.8495	101.4039	94.2852	85.1353	84.1432	87.9499	93.6421	106.9103	113.4391	125.2152	(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	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0009	23.0938	18.7811	14.2185	10.6285	8.9730	9.6957	12.6028	16.9155	21.4781	25.0681	26.7235	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.2262	370.0265	360.4499	340.0625	314.3270	290.1393	273.9804	270.1801	279.7567	300.1442	325.8796	350.0673	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	(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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)	169.9651	167.0371	159.7439	140.8387	126.7274	118.2434	113.0957	118.2122	130.0585	143.6966	157.5543	168.2999	(72)
Total internal gains	669.3001	667.2652	646.0828	602.2276	558.7908	524.4636	503.8797	508.1031	533.8385	572.4267	615.6098	652.1987	(73)

6. Solar gains

[Jan]													
			Area		Solar flux		g		FF		Access		Gains
			m2		Table 6a		or Table 6b		Specific data		factor		W
					W/m2				or Table 6c		Table 6d		
North			7.0200		10.6334		0.5000		0.7000		0.7700		18.1055 (74)
South			13.2300		46.7521		0.5000		0.7000		0.7700		150.0244 (78)
Solar gains	168.1299	280.3018	371.7746	448.1746	495.8325	490.9320	473.7553	437.4787	397.6348	306.1993	200.1655	144.7285	(83)
Total gains	837.4300	947.5670	1017.8574	1050.4022	1054.6233	1015.3956	977.6350	945.5817	931.4733	878.6260	815.7754	796.9272	(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	61.1786	61.2952	61.4099	61.9542	62.0572	62.5408	62.5408	62.6312	62.3537	62.0572	61.8493	61.6335	
alpha	5.0786	5.0863	5.0940	5.1303	5.1371	5.1694	5.1694	5.1754	5.1569	5.1371	5.1233	5.1089	
util living area	0.9849	0.9711	0.9440	0.8863	0.7743	0.5970	0.4374	0.4706	0.6832	0.8949	0.9710	0.9880	(86)
Living	20.1642	20.3089	20.4947	20.6960	20.8463	20.9208	20.9368	20.9354	20.9015	20.7190	20.4037	20.1313	
Non living	19.0622	19.2446	19.4749	19.7200	19.8831	19.9556	19.9655	19.9662	19.9393	19.7527	19.3722	19.0260	
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	20.5724	20.3089	20.4947	20.6960	20.8463	20.9208	20.9368	20.9354	20.9015	20.7190	20.4037	20.2528	(87)
Th 2	20.0242	20.0259	20.0275	20.0353	20.0367	20.0434	20.0434	20.0447	20.0408	20.0367	20.0338	20.0307	(88)
util rest of house	0.9807	0.9632	0.9289	0.8561	0.7193	0.5162	0.3442	0.3757	0.6046	0.8607	0.9617	0.9845	(89)
MIT 2	19.6407	19.2446	19.4749	19.7200	19.8831	19.9556	19.9655	19.9662	19.9393	19.7527	19.3722	19.2070	(90)
Living area fraction												0.1364	(91)
MIT	19.7677	19.3897	19.6140	19.8531	20.0145	20.0872	20.0979	20.0983	20.0705	19.8845	19.5128	19.3496	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7677	19.3897	19.6140	19.8531	20.0145	20.0872	20.0979	20.0983	20.0705	19.8845	19.5128	19.3496	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9793	0.9568	0.9212	0.8496	0.7179	0.5201	0.3496	0.3811	0.6072	0.8544	0.9553	0.9814	(94)
Useful gains	820.1139	906.6606	937.6612	892.4092	757.0882	528.0816	341.7965	360.3499	565.5673	750.6845	779.3121	782.1165	(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	1549.5469	1448.8062	1308.8024	1083.5369	821.1460	537.7341	342.7858	361.9041	586.8500	916.9438	1230.0228	1506.4782	(97)
Space heating kWh	542.6981	364.3219	276.1290	137.6120	47.6590	0.0000	0.0000	0.0000	0.0000	123.6969	324.5117	538.9251	(98a)
Space heating requirement - total per year (kWh/year)												2355.5537	
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	542.6981	364.3219	276.1290	137.6120	47.6590	0.0000	0.0000	0.0000	0.0000	123.6969	324.5117	538.9251	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2355.5537	
Space heating per m2												25.1931	(99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													279.0938 (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	542.6981	364.3219	276.1290	137.6120	47.6590	0.0000	0.0000	0.0000	0.0000	123.6969	324.5117	538.9251	(98)
Space heating efficiency (main heating system 1)	279.0938	279.0938	279.0938	279.0938	279.0938	0.0000	0.0000	0.0000	0.0000	279.0938	279.0938	279.0938	(210)
Space heating fuel (main heating system)	194.4501	130.5374	98.9377	49.3067	17.0763	0.0000	0.0000	0.0000	0.0000	44.3209	116.2734	193.0982	(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	312.3006	259.9798	232.0935	166.3681	125.0105	107.8165	103.9512	127.1286	164.4529	226.6766	275.3518	308.5746	(64)
Efficiency of water heater	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	176.3709	(216)
Fuel for water heating, kWh/month	177.0704	147.4052	131.5940	94.3285	70.8793	61.1305	58.9390	72.0803	93.2426	128.5227	156.1209	174.9578	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-38.2903	-56.8127	-84.6534	-96.4075	-102.5633	-94.4349	-92.9601	-87.8128	-77.8367	-64.9051	-42.7658	-32.7103	(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												844.0009	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.3709	
Water heating fuel used												1366.2712	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												183.6736	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-872.1527	(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												1601.7930	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	844.0009	16.4900	139.1757	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1366.2712	16.4900	225.2981	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	183.6736	16.4900	30.2878	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-872.1527	16.4900	-143.8180	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-143.8180	(252)
Total energy cost			264.1357	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.6866	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	88.8708	
SAP rating (Section 12)		89	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	844.0009	0.1565	132.0837 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1366.2712	0.1452	198.3242 (264)
Space and water heating			330.4079 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	183.6736	0.1443	26.5098 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-872.1527	0.1344	-117.2063
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-117.2063 (269)
Total CO2, kg/year			250.8083 (272)
CO2 emissions per m2			2.6800 (273)
EI value			97.5734
EI rating			98 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (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) =	0.1258 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3258	(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) =	0.2770 (21)

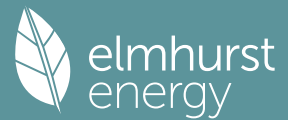
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2908	0.2770	0.2770	0.2562	0.2562	0.2285	0.2354	0.2216	0.2285	0.2423	0.2423	0.2631 (22b)
Effective ac	0.5423	0.5384	0.5384	0.5328	0.5328	0.5261	0.5277	0.5245	0.5261	0.5294	0.5294	0.5346 (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
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000 (28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800 (29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500 (30)
Total net area of external elements Aum(A, m2)			192.5440				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	50.7053			(33)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000 (32)
GF			92.6800			75.0000	6951.0000 (32c)
FF			100.4900			9.0000	904.4100 (32c)
Internal Floor 1			46.7500			18.0000	841.5000 (32d)
Internal Ceiling 1			46.7500			9.0000	420.7500 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	22063.7900			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				235.9764			(35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	10.6400	0.0260	0.2766
E2 Other lintels (including other steel lintels)	4.9000	0.0230	0.1127
E3 Sill	54.7600	0.0180	0.9857
E4 Jamb	19.4200	0.0680	1.3206
E5 Ground floor (normal)	19.4200	0.0010	0.0194
E6 Intermediate floor within a dwelling	10.2000	0.0400	0.4080
E16 Corner (normal)	10.2000	0.0320	0.3264
E18 Party wall between dwellings	2.4000	0.0280	0.0672
E25 Staggered party wall between dwellings	8.8200	0.0580	0.5116
P1 Party wall - Ground floor			

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E10 Eaves (insulation at ceiling level)	10.6000	0.0550	0.5830	
E12 Gable (insulation at ceiling level)	8.8200	0.0370	0.3263	
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.0330	0.2911	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.2286 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		55.9338 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)				
Jan	Feb	Mar	Apr	May
(38)m	42.6669	42.3576	42.3576	41.9220
Heat transfer coeff	98.6007	98.2914	98.2914	97.8558
Average = Sum(39)m / 12 =				
Jan	Feb	Mar	Apr	May
HLP	1.0546	1.0512	1.0512	1.0466
HLP (average)				
Days in mont	31	28	31	30

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6707 (42)
Hot water usage for mixer showers	94.8722	93.4465	91.3689	87.3938	84.4603	81.1888	79.3294	81.3912	83.6514	87.1639	91.2244	94.5087 (42a)	
Hot water usage for baths	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939 (42b)	
Hot water usage for other uses	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802 (42c)	
Average daily hot water use (litres/day)												153.2572 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	166.6471	163.2523	159.0250	152.3745	147.0541	141.3022	138.9274	143.1346	147.5950	153.6549	160.4145	166.1829 (44)	
Energy content (annual)	263.9282	232.4691	244.4155	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022 (45)	
Distribution loss (46)m = 0.15 x (45)m	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303 (46)	
Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8100 (55)	
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)	
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (57)	
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	312.3006	276.1603	291.3922	248.6514	233.5411	207.9528	203.3661	213.5065	223.4086	255.4849	275.3518	308.5746 (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)	
Aperture area of solar collector												3.0000 (H1)	
Zero-loss collector efficiency												0.8000 (H2)	
Collector linear heat loss coefficient												1.8000 (H3)	
Collector 2nd order heat loss coefficient												0.0000 (H4)	
Collector loop efficiency												0.9000 (H5)	
Incidence angle modifier												1.0000 (H6)	
Overshading factor												0.8000 (H8)	
Overall heat loss coefficient of system												6.5000 (H10)	
Heat loss coefficient of collector loop												3.9667 (H11)	
Dedicated solar storage volume												75.0000 (H12)	
Effective solar volume												75.0000 (H14)	
Reference volume												225.0000 (H15)	
Storage tank correction coefficient												1.3161 (H16)	
Heat delivered to hot water												699.7123 (H24)	
Heat delivered to space heating												0.0000 (H29)	
Solar input												699.7123	
Solar input	-0.0000	-17.5810	-60.3565	-86.8696	-110.6584	-110.4092	-108.2258	-97.5779	-68.0376	-35.9204	-4.0761	-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	312.3006	258.5793	231.0357	161.7818	122.8827	97.5436	95.1403	115.9286	155.3710	219.5645	271.2758	308.5746 (64)	
												Total per year (kWh/year) = Sum(64a)m = 2349.9785 (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	126.4541	112.2489	118.8495	101.4039	94.2852	85.1353	84.1432	87.9499	93.6421	106.9103	113.4391	125.2152 (65)	

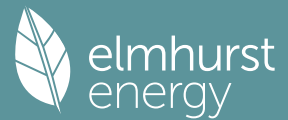
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0009	23.0938	18.7811	14.2185	10.6285	8.9730	9.6957	12.6028	16.9155	21.4781	25.0681	26.7235 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.2262	370.0265	360.4499	340.0625	314.3270	290.1393	273.9804	270.1801	279.7567	300.1442	325.8796	350.0673 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946 (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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265 (71)
Water heating gains (Table 5)	169.9651	167.0371	159.7439	140.8387	126.7274	118.2434	113.0957	118.2122	130.0585	143.6966	157.5543	168.2999 (72)
Total internal gains	669.3001	667.2652	646.0828	602.2276	558.7908	524.4636	503.8797	508.1031	533.8385	572.4267	615.6098	652.1987 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2				Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d	W	
North	7.0200				11.9814	0.5000		0.7000		0.7700	20.4008 (74)	
South	13.2300				50.9848	0.5000		0.7000		0.7700	163.6071 (78)	

Solar gains	184.0079	275.8595	362.1068	452.8560	491.6865	522.7854	498.2960	467.6455	420.7022	321.8258	224.3586	156.9299 (83)
Total gains	853.3079	943.1247	1008.1896	1055.0835	1050.4773	1047.2490	1002.1757	975.7485	954.5407	894.2526	839.9684	809.1286 (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	62.1581	62.3537	62.3537	62.6312	62.6312	62.9711	62.8894	63.0505	62.9711	62.8055	62.8055	62.5408
alpha	5.1439	5.1569	5.1569	5.1754	5.1754	5.1981	5.1926	5.2034	5.1981	5.1870	5.1870	5.1694
util living area	0.9796	0.9653	0.9304	0.8500	0.6957	0.4600	0.3010	0.3182	0.5750	0.8488	0.9568	0.9835 (86)
Living	20.2690	20.3866	20.5742	20.7663	20.8924	20.9359	20.9399	20.9399	20.9260	20.7950	20.5133	20.2405
Non living	19.2058	19.3541	19.5828	19.8071	19.9338	19.9710	19.9716	19.9739	19.9655	19.8446	19.5184	19.1746
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	20.6261	20.3866	20.5742	20.7663	20.8924	20.9359	20.9399	20.9399	20.9260	20.7950	20.5133	20.3467 (87)
Th 2	20.0381	20.0408	20.0408	20.0447	20.0447	20.0494	20.0482	20.0504	20.0494	20.0471	20.0471	20.0434 (88)
util rest of house	0.9737	0.9557	0.9113	0.8115	0.6287	0.3749	0.2089	0.2241	0.4879	0.8024	0.9429	0.9786 (89)
MIT 2	19.7063	19.3541	19.5828	19.8071	19.9338	19.9710	19.9716	19.9739	19.9655	19.8446	19.5184	19.3311 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.8317	19.4949	19.7180	19.9379	20.0645	20.1026	20.1036	20.1057	20.0965	19.9742	19.6541	19.4696 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.8317	19.4949	19.7180	19.9379	20.0645	20.1026	20.1036	20.1057	20.0965	19.9742	19.6541	19.4696 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9722	0.9489	0.9037	0.8067	0.6302	0.3797	0.2142	0.2296	0.4924	0.7984	0.9359	0.9749 (94)
Useful gains	829.5910	894.9531	911.1370	851.1164	661.9799	397.6494	214.6976	224.0399	470.0263	713.9443	786.1026	788.8368 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1452.5590	1365.7481	1210.7547	982.2639	691.3023	399.2982	214.7542	224.1218	476.5655	817.1907	1137.2549	1408.1847 (97)
Space heating kWh	463.4883	316.3743	222.9156	94.4262	21.8159	0.0000	0.0000	0.0000	0.0000	76.8153	252.8297	460.7948 (98a)
Space heating requirement - total per year (kWh/year)	1909.4601											
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	463.4883	316.3743	222.9156	94.4262	21.8159	0.0000	0.0000	0.0000	0.0000	76.8153	252.8297	460.7948 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1909.4601											
Space heating per m2	(98c) / (4) = 20.4220 (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 %)												278.6721 (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	463.4883	316.3743	222.9156	94.4262	21.8159	0.0000	0.0000	0.0000	0.0000	76.8153	252.8297	460.7948 (98)
Space heating efficiency (main heating system 1)	278.6721	278.6721	278.6721	278.6721	278.6721	0.0000	0.0000	0.0000	0.0000	278.6721	278.6721	278.6721 (210)
Space heating fuel (main heating system)	166.3203	113.5292	79.9921	33.8843	7.8285	0.0000	0.0000	0.0000	0.0000	27.5648	90.7266	165.3538 (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	312.3006	258.5793	231.0357	161.7818	122.8827	97.5436	95.1403	115.9286	155.3710	219.5645	271.2758	308.5746 (64)
Efficiency of water heater (217)m	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306	176.5306 (216)
Fuel for water heating, kWh/month	176.9102	146.4785	130.8758	91.6452	69.6099	55.2559	53.8945	65.6706	88.0136	124.3776	153.6707	174.7995 (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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.9774	-56.8867	-83.7189	-96.7393	-101.4768	-97.2085	-95.2472	-91.2192	-81.3848	-67.7495	-47.5022	-35.6113 (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)												

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(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												685.1995	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.5306	
Water heating fuel used												1331.2021	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												183.6736	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-896.7218	(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												1383.3534	(238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	685.1995	26.0600	178.5630	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1331.2021	26.0600	346.9113	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	26.0600	20.8480	(249)
Energy for lighting	183.6736	26.0600	47.8653	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.7218	26.0600	-233.6857	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-233.6857	(252)
Total energy cost			360.5019	(255)

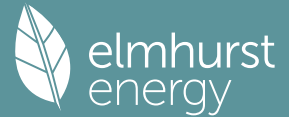
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	685.1995	0.1573	107.7937	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1331.2021	0.1457	193.9084	(264)
Space and water heating			301.7021	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	183.6736	0.1443	26.5098	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.7218	0.1344	-120.5562	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-120.5562	(269)
Total CO2, kg/year			218.7527	(272)

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	685.1995	1.5824	1084.2455	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1331.2021	1.5388	2048.4914	(278)
Space and water heating			3132.7369	(279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240	(281)
Energy for lighting	183.6736	1.5338	281.7247	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.7218	1.4969	-1342.2662	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1342.2662	(283)
Total Primary energy kWh/year			2193.2195	(286)

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Property Reference	House Type E				Issued on Date	29/01/2025	
Assessment Reference	Be Lean Act			Prop Type Ref			
Property							
SAP Rating	99 A		DER	9.71		TER	9.96
Environmental	91 B		% DER < TER				2.51
CO ₂ Emissions (t/year)	0.98		DFEE	39.80		TFEE	40.45
Compliance Check	See BREL		% DFEE < TFEE				1.59
% DPER < TPER	0.48		DPER	51.74		TPER	51.99
Assessor Details	Mr. James Rivers					Assessor ID	R423-0001
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)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220 (5)

2. Ventilation rate

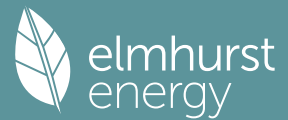
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3241 (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) = 0.2755 (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	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237 (22b)
Effective ac	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524 (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
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511		(27)
Door 1.2			2.2200	1.2000	2.6640		(26)
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000 (28a)
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000 (29a)
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800 (30)
Total net area of external elements Aum(A, m ²)			300.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.8490		(33)
GF			87.5000			75.0000	6562.5000 (32c)
FF			113.6700			9.0000	1023.0300 (32c)
Internal Floor 1			63.2200			18.0000	1137.9600 (32d)
Internal Ceiling 1			63.2200			9.0000	568.9800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26367.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.5349 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.6200	0.0260	0.4581	
E3 Sill				7.7300	0.0230	0.1778	
E4 Jamb				84.7200	0.0180	1.5250	

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E5 Ground floor (normal)						34.1000	0.0680	2.3188				
E6 Intermediate floor within a dwelling						34.1000	0.0010	0.0341				
E16 Corner (normal)						30.6000	0.0400	1.2240				
E17 Corner (inverted - internal area greater than external area)						10.2000	0.0320	0.3264				
E10 Eaves (insulation at ceiling level)						19.5000	0.0550	1.0725				
E12 Gable (insulation at ceiling level)						14.6000	0.0370	0.5402				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											7.6769	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											90.5259	(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	59.7614	59.5066	59.2568	58.0837	57.8643	56.8425	56.8425	56.6533	57.2361	57.8643	58.3083	58.7725 (38)
Average = Sum(39)m / 12 =	150.2873	150.0325	149.7828	148.6097	148.3902	147.3684	147.3684	147.1792	147.7620	148.3902	148.8342	149.2984 (39)
												148.6086
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1886	1.1866	1.1846	1.1753	1.1736	1.1655	1.1655	1.1640	1.1686	1.1736	1.1771	1.1808 (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												2.8851 (42)
Hot water usage for mixer showers												
	99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342 (42a)
Hot water usage for baths												
	31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350 (42b)
Hot water usage for other uses												
	44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766 (42c)
Average daily hot water use (litres/day)												161.2461 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458 (44)
Energy conte	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662 (45)
Energy content (annual)												
Distribution loss	(46)m = 0.15 x (45)m											
	41.6530	36.6881	38.5734	32.9199	31.2423	27.4206	26.5169	27.9704	28.7230	32.9066	36.0680	41.0649 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss												
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage												
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386 (62)
PV diverter	-28.3932	-25.1112	-26.2950	-21.7733	-20.2919	-17.3640	-16.2759	-17.3078	-17.9654	-21.1793	-23.9935	-27.8674 (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	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718	294.2712 (64)
12Total per year (kWh/year)												2984.0423 (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												
	131.0287	116.2782	124.2023	110.4221	107.9517	98.2320	97.4770	100.6989	101.1190	111.6409	117.4003	129.7252 (65)

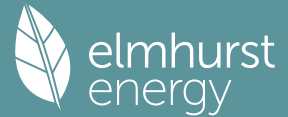
5. Internal gains (see Table 5 and 5a)												

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	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.9748	163.8292	147.9748	152.9073	147.9748	152.9073	147.9748	147.9748	152.9073	147.9748	152.9073	147.9748 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	293.3766	296.4209	288.7493	272.4173	251.8012	232.4249	219.4803	216.4360	224.1076	240.4396	261.0557	280.4320 (68)
Pumps, fans	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256 (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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)
Total internal gains	176.1138	173.0330	166.9386	153.3641	145.0964	136.4333	131.0174	135.3480	140.4430	150.0550	163.0560	174.3618 (72)
	686.7421	702.5600	672.9396	647.9656	614.1493	588.0424	564.7494	566.0357	583.7348	607.7463	646.2959	672.0455 (73)

6. Solar gains												

[Jan]												
			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		W/m2		Specific data		factor	W
									or Table 6c		Table 6d	
North			12.7900		10.6334		0.5000		0.7000		0.7700	32.9871 (74)
South			17.7400		46.7521		0.5000		0.7000		0.7700	201.1665 (78)
West			4.7100		19.6403		0.5000		0.7000		0.7700	22.4372 (80)
Solar gains	256.5908	436.3909	599.0764	751.8051	855.2540	856.0584	822.3349	743.2976	651.2597	482.4748	307.1213	219.7773 (83)
Total gains	943.3329	1138.9509	1272.0160	1399.7707	1469.4033	1444.1008	1387.0843	1309.3333	1234.9945	1090.2210	953.4172	891.8228 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7347	48.8175	48.8989	49.2849	49.3578	49.7000	49.7000	49.7639	49.5676	49.3578	49.2105	49.0575	
alpha	4.2490	4.2545	4.2599	4.2857	4.2905	4.3133	4.3133	4.3176	4.3045	4.2905	4.2807	4.2705	
util living area	0.9902	0.9780	0.9549	0.8968	0.7847	0.6129	0.4579	0.5022	0.7267	0.9214	0.9801	0.9922 (86)	
MIT	19.7834	19.9821	20.2320	20.5327	20.7627	20.8859	20.9187	20.9141	20.8392	20.5357	20.1024	19.7472 (87)	
Th 2	19.9291	19.9307	19.9323	19.9398	19.9412	19.9477	19.9477	19.9489	19.9452	19.9412	19.9384	19.9354 (88)	
util rest of house	0.9875	0.9722	0.9427	0.8691	0.7301	0.5268	0.3530	0.3944	0.6463	0.8941	0.9738	0.9900 (89)	
MIT 2	18.5155	18.7678	19.0815	19.4511	19.7084	19.8301	19.8523	19.8514	19.7917	19.4643	18.9284	18.4744 (90)	
Living area fraction									fLA = Living area / (4) =				0.1236 (91)
MIT	18.6723	18.9179	19.2237	19.5848	19.8388	19.9606	19.9841	19.9828	19.9212	19.5968	19.0735	18.6317 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.6723	18.9179	19.2237	19.5848	19.8388	19.9606	19.9841	19.9828	19.9212	19.5968	19.0735	18.6317 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9831	0.9649	0.9325	0.8581	0.7242	0.5279	0.3567	0.3980	0.6443	0.8831	0.9668	0.9863 (94)
Useful gains	927.3991	1098.9369	1186.2076	1201.2056	1064.1231	762.3400	494.8179	521.0555	795.6600	962.7423	921.7811	879.6214 (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	2159.9692	2103.1472	1905.7901	1587.8666	1207.7127	789.9878	498.7085	527.3119	860.1534	1335.0296	1782.0727	2154.6354 (97)
Space heating kWh	917.0322	674.8293	535.3694	278.3959	106.8306	0.0000	0.0000	0.0000	0.0000	276.9818	619.4099	948.6104 (98a)
Space heating requirement - total per year (kWh/year)												4357.4595
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	917.0322	674.8293	535.3694	278.3959	106.8306	0.0000	0.0000	0.0000	0.0000	276.9818	619.4099	948.6104 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4357.4595
Space heating per m2										(98c) / (4) =		34.4627 (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 %)													88.8000 (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	917.0322	674.8293	535.3694	278.3959	106.8306	0.0000	0.0000	0.0000	0.0000	276.9818	619.4099	948.6104 (98)	
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)	
Space heating fuel (main heating system)	1032.6939	759.9429	602.8934	313.5089	120.3048	0.0000	0.0000	0.0000	0.0000	311.9164	697.5337	1068.2550 (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	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718	294.2712 (64)	
Efficiency of water heater												79.8000 (216)	
(217)m	86.4118	86.0763	85.4948	84.3516	82.3996	79.8000	79.8000	79.8000	79.8000	84.3212	85.9101	86.4905 (217)	
Fuel for water heating, kWh/month	344.4734	305.7369	326.6088	289.8640	286.8491	265.9803	261.7488	272.5987	276.1070	292.4182	306.4503	340.2354 (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 (230)	
Lighting	27.1851	21.8089	19.6365	14.3865	11.1126	9.0791	10.1373	13.1768	17.1154	22.4563	25.3643	27.9407 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-60.6544	-88.1800	-129.8663	-144.0666	-149.8697	-137.3427	-135.1524	-130.1103	-118.7379	-100.6126	-67.0058	-51.6184 (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	-42.1253	-99.5019	-229.1708	-388.4110	-548.2005	-564.4106	-550.8800	-443.2569	-293.7249	-150.3655	-58.1813	-32.1333 (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													4907.0490 (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													3569.0709 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													219.3993 (232)

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

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PV generation	-4713.5792 (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	4067.9400 (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	4907.0490	0.2100	1030.4803 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3569.0709	0.2100	749.5049 (264)
Space and water heating			1779.9852 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	219.3993	0.1443	31.6661 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1313.2171	0.1348	-177.0057
PV Unit electricity exported	-3400.3621	0.1230	-418.3660
Total			-595.3718 (269)
Total CO2, kg/year			1228.2088 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.7100 (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	4907.0490	1.1300	5544.9654 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3569.0709	1.1300	4033.0501 (278)
Space and water heating			9578.0155 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	219.3993	1.5338	336.5219 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1313.2171	1.4982	-1967.4327
PV Unit electricity exported	-3400.3621	0.4515	-1535.2517
Total			-3502.6844 (283)
Total Primary energy kWh/year			6541.9538 (286)
Dwelling Primary energy Rate (DPER)			51.7400 (287)

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

1. Overall dwelling characteristics

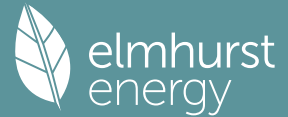
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220 (5)

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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (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) = 0.3180 (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	0.4054	0.3974	0.3895	0.3497	0.3418	0.3021	0.3021	0.2941	0.3180	0.3418	0.3577	0.3736 (22b)
Effective ac	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5640	0.5698 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2200	1.0000	2.2200			(26)
TER Opening Type (Uw = 1.20)			29.4000	1.1450	33.6641			(27)
Heat Loss Floor 1			63.2200	0.1300	8.2186			(28a)
Cavity Wall	173.9100	31.6200	142.2900	0.1800	25.6122			(29a)
Joist	63.2200		63.2200	0.1100	6.9542			(30)
Total net area of external elements Aum(A, m2)			300.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		76.6691			(33)

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

208.5349 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	17.6200	0.0500	0.8810	
E3 Sill	7.7300	0.0500	0.3865	
E4 Jamb	84.7200	0.0500	4.2360	
E5 Ground floor (normal)	34.1000	0.1600	5.4560	
E6 Intermediate floor within a dwelling	34.1000	0.0000	0.0000	
E16 Corner (normal)	30.6000	0.0900	2.7540	
E17 Corner (inverted - internal area greater than external area)	10.2000	-0.0900	-0.9180	
E10 Eaves (insulation at ceiling level)	19.5000	0.0600	1.1700	
E12 Gable (insulation at ceiling level)	14.6000	0.0600	0.8760	

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

14.8415 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 91.5106 (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	61.9425	61.6030	61.2702	59.7072	59.4147	58.0534	58.0534	57.8013	58.5778	59.4147	60.0063	60.6248	(38)
Average = Sum(39)m / 12 =	153.4531	153.1136	152.7808	151.2178	150.9254	149.5640	149.5640	149.3119	150.0884	150.9254	151.5170	152.1354	(39)
												151.2164	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2136	1.2110	1.2083	1.1960	1.1937	1.1829	1.1829	1.1809	1.1870	1.1937	1.1983	1.2032	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

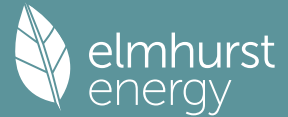
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8851 (42)
Hot water usage for mixer showers													
72.5939	71.5030	69.9132	66.8716	64.6269	62.1237	60.7009	62.2786	64.0080	66.6957	69.8027	72.3158	(42a)	
Hot water usage for baths													
31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	(42b)	
Hot water usage for other uses													
44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	(42c)	
Average daily hot water use (litres/day)													136.1477 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use													
148.1114	144.9486	141.0970	135.2404	130.4844	125.3713	123.4064	127.2414	131.2860	136.6538	142.6007	147.7273	(44)	
Energy content (annual)													
234.5723	206.4049	216.8609	185.1373	175.6570	154.1586	149.2494	157.5515	161.8887	185.4379	203.1608	231.3053	(45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2261.3847
35.1858	30.9607	32.5291	27.7706	26.3486	23.1238	22.3874	23.6327	24.2833	27.8157	30.4741	34.6958	(46)	
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)	
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	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													
281.1672	248.4906	263.4558	230.2292	222.2519	199.2505	195.8443	204.1464	206.9806	232.0328	248.2526	277.9002	(62)	
WWHRS	-33.1869	-29.3508	-30.7344	-25.4493	-23.7179	-20.2955	-19.0238	-20.2299	-20.9985	-24.7550	-28.0444	-32.5723	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
247.9803	219.1399	232.7213	204.7799	198.5341	178.9549	176.8205	183.9164	185.9820	207.2779	220.2082	245.3279	(64)	
12Total per year (kWh/year)													2501.6433 (64)
Electric shower(s)													2502 (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													
115.2712	102.2982	109.3822	97.6316	95.6819	87.3312	86.9013	89.6618	89.9015	98.9340	103.6244	114.1849	(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	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.9748	163.8292	147.9748	152.9073	147.9748	152.9073	147.9748	147.9748	152.9073	147.9748	152.9073	147.9748	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	293.3766	296.4209	288.7493	272.4173	251.8012	232.4249	219.4803	216.4360	224.1076	240.4396	261.0557	280.4320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	(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)													
	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	(71)
Water heating gains (Table 5)													
	154.9344	152.2295	147.0190	135.5995	128.6047	121.2933	116.8029	120.5131	124.8632	132.9759	143.9228	153.4744	(72)

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Total internal gains
665.5627 681.7565 653.0200 630.2010 597.6575 572.9024 550.5349 551.2008 568.1549 590.6671 627.1627 651.1581 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	10.6700		10.6334		0.6300		0.7000		0.7700		34.6743 (74)	
South	14.8000		46.7521		0.6300		0.7000		0.7700		211.4630 (78)	
West	3.9300		19.6403		0.6300		0.7000		0.7700		23.5891 (80)	
Solar gains	269.7264	458.7316	629.7468	790.2956	899.0410	899.8865	864.4365	781.3527	684.6021	507.1751	322.8438	231.0282 (83)
Total gains	935.2891	1140.4881	1282.7668	1420.4967	1496.6986	1472.7889	1414.9714	1332.5535	1252.7570	1097.8422	950.0066	882.1864 (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	47.7293	47.8351	47.9393	48.4348	48.5287	48.9704	48.9704	49.0531	48.7993	48.5287	48.3392	48.1427
alpha	4.1820	4.1890	4.1960	4.2290	4.2352	4.2647	4.2647	4.2702	4.2533	4.2352	4.2226	4.2095
util living area	0.9906	0.9783	0.9548	0.8955	0.7822	0.6095	0.4554	0.5002	0.7258	0.9218	0.9807	0.9925 (86)
MIT	19.4245	19.7000	20.0452	20.4611	20.7748	20.9423	20.9867	20.9804	20.8776	20.4609	19.8655	19.3786 (87)
Th 2	19.9091	19.9112	19.9133	19.9232	19.9251	19.9337	19.9337	19.9353	19.9304	19.9251	19.9213	19.9174 (88)
util rest of house	0.9880	0.9725	0.9426	0.8674	0.7268	0.5227	0.3497	0.3915	0.6445	0.8944	0.9745	0.9905 (89)
MIT 2	18.0913	18.4410	18.8741	19.3841	19.7345	19.8991	19.9290	19.9277	19.8464	19.3972	18.6609	18.0385 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2561	18.5966	19.0188	19.5172	19.8631	20.0280	20.0598	20.0578	19.9739	19.5287	18.8098	18.2041 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.2561	18.5966	19.0188	19.5172	19.8631	20.0280	20.0598	20.0578	19.9739	19.5287	18.8098	18.2041 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9821	0.9629	0.9295	0.8548	0.7232	0.5308	0.3625	0.4044	0.6482	0.8818	0.9654	0.9855 (94)
Useful gains	918.5781	1098.1349	1192.3891	1214.2107	1082.4762	781.8024	512.9337	538.9389	812.0053	968.0541	917.1823	869.4252 (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	2141.6037	2097.1371	1912.6392	1605.5083	1232.0201	811.8387	517.4544	546.1513	881.5975	1347.5672	1774.2325	2130.5266 (97)
Space heating kWh	909.9311	671.3295	535.8661	281.7342	111.2606	0.0000	0.0000	0.0000	0.0000	282.3578	617.0761	938.2594 (98a)
Space heating requirement - total per year (kWh/year)												4347.8149
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	909.9311	671.3295	535.8661	281.7342	111.2606	0.0000	0.0000	0.0000	0.0000	282.3578	617.0761	938.2594 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4347.8149
Space heating per m ²												(98c) / (4) = 34.3864 (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	909.9311	671.3295	535.8661	281.7342	111.2606	0.0000	0.0000	0.0000	0.0000	282.3578	617.0761	938.2594 (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)	985.8408	727.3342	580.5700	305.2375	120.5424	0.0000	0.0000	0.0000	0.0000	305.9131	668.5549	1016.5324 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	247.9803	219.1399	232.7213	204.7799	198.5341	178.9549	176.8205	183.9164	185.9820	207.2779	220.2082	245.3279 (64)
Efficiency of water heater	7.3041	86.4019	85.8677	84.7756	82.8144	79.8000	79.8000	79.8000	79.8000	84.7535	86.2419	79.8000 (216)
Fuel for water heating, kWh/month	286.0022	253.6285	271.0232	241.5552	239.7337	224.2543	221.5795	230.4717	233.0602	244.5655	255.3379	282.7285 (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	30.7462	24.6658	22.2088	16.2711	12.5683	10.2684	11.4652	14.9029	19.3574	25.3980	28.6869	31.6008 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-56.2824	-77.9276	-110.0134	-121.3748	-128.8941	-119.5150	-117.9236	-112.2104	-101.9552	-87.8848	-61.3218	-48.8180 (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)												

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(233b)m	-36.2841	-75.7631	-149.5926	-223.3025	-294.0063	-295.0396	-291.6718	-247.6239	-182.3189	-108.0136	-48.3243	-28.7454	(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												4710.5253	(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												2983.9404	(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)												248.1398	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												-3124.8069	(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												4903.7986	(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	4710.5253	0.2100	989.2103	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2983.9404	0.2100	626.6275	(264)
Space and water heating			1615.8378	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	248.1398	0.1443	35.8142	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.1210	0.1350	-154.4518	
PV Unit electricity exported	-1980.6859	0.1261	-249.7051	
Total			-404.1569	(269)
Total CO2, kg/year			1259.4244	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9600	(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	4710.5253	1.1300	5322.8936	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2983.9404	1.1300	3371.8526	(278)
Space and water heating			8694.7462	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	248.1398	1.5338	380.6051	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.1210	1.4989	-1714.9748	
PV Unit electricity exported	-1980.6859	0.4628	-916.6038	
Total			-2631.5786	(283)
Total Primary energy kWh/year			6573.8735	(286)
Target Primary Energy Rate (TPER)			51.9900	(287)

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

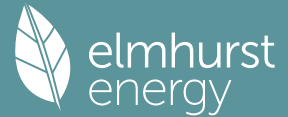
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)	
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure Test												40.0000 / (5) =	0.1241 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												4.0000 (17)	
Number of sides sheltered												0.3241 (18)	
												2 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.2755 (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)
	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524	(25)

3. Heat losses and heat loss parameter

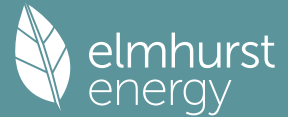
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511			(27)
Door 1.2			2.2200	1.2000	2.6640			(26)
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000	(28a)
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000	(29a)
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800	(30)
Total net area of external elements Aum(A, m ²)			300.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.8490			(33)
GF			87.5000			75.0000	6562.5000	(32c)
FF			113.6700			9.0000	1023.0300	(32c)
Internal Floor 1			63.2200			18.0000	1137.9600	(32d)
Internal Ceiling 1			63.2200			9.0000	568.9800	(32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	26367.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								208.5349 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				17.6200	0.0260	0.4581		
E3 Sill				7.7300	0.0230	0.1778		
E4 Jamb				84.7200	0.0180	1.5250		
E5 Ground floor (normal)				34.1000	0.0680	2.3188		
E6 Intermediate floor within a dwelling				34.1000	0.0010	0.0341		
E16 Corner (normal)				30.6000	0.0400	1.2240		
E17 Corner (inverted - internal area greater than external area)				10.2000	0.0320	0.3264		
E10 Eaves (insulation at ceiling level)				19.5000	0.0550	1.0725		
E12 Gable (insulation at ceiling level)				14.6000	0.0370	0.5402		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6769	(36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	90.5259 (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	59.7614	59.5066	59.2568	58.0837	57.8643	56.8425	56.8425	56.6533	57.2361	57.8643	58.3083	58.7725	(38)
Average = Sum(39)m / 12 =	150.2873	150.0325	149.7828	148.6097	148.3902	147.3684	147.3684	147.1792	147.7620	148.3902	148.8342	149.2984	(39)
												148.6086	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1886	1.1866	1.1846	1.1753	1.1736	1.1655	1.1655	1.1640	1.1686	1.1736	1.1771	1.1808	(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													2.8851 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	31.2350	(42b)
Hot water usage for other uses													
44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	44.1766	(42c)
Average daily hot water use (litres/day)												69.2185	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
75.5175	73.4457	71.1838	68.3688	65.8574	63.2476	62.7056	64.9629	67.2780	69.9581	72.7980	75.4116	75.4116	(44)
Energy conte	119.6013	104.5856	109.4068	93.5935	88.6568	77.7703	75.8369	80.4376	82.9605	94.9325	103.7140	118.0763	(45)
Energy content (annual)												1149.5721	
Distribution loss (46)m = 0.15 x (45)m													
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	(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	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													
101.6611	88.8978	92.9958	79.5545	75.3583	66.1047	64.4614	68.3719	70.5164	80.6926	88.1569	100.3649	100.3649	(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	101.6611	88.8978	92.9958	79.5545	75.3583	66.1047	64.4614	68.3719	70.5164	80.6926	88.1569	100.3649	(64)
12Total per year (kWh/year)												977.1363	(64)
Electric shower(s)	58.1356	51.7993	56.5629	53.9772	54.9901	52.4552	54.2037	54.9901	53.9772	56.5629	55.4993	58.1356	(64a)

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Heat gains from water heating, kWh/month
 39.9492 35.1743 37.3897 33.3829 32.5871 29.6400 29.6663 30.8405 31.1234 34.3139 35.9141 39.6251 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 661.2892 (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	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.9748	163.8292	147.9748	152.9073	147.9748	152.9073	147.9748	147.9748	152.9073	147.9748	152.9073	147.9748	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.3766	296.4209	288.7493	272.4173	251.8012	232.4249	219.4803	216.4360	224.1076	240.4396	261.0557	280.4320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	(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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	(71)
Water heating gains (Table 5)	53.6951	52.3427	50.2549	46.3652	43.7999	41.1667	39.8740	41.4523	43.2270	46.1208	49.8806	53.2596	(72)
Total internal gains	561.3234	578.8697	553.2559	537.9667	509.8527	492.7757	473.6060	472.1400	486.5187	500.8120	530.1205	547.9433	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	12.7900	10.6334	0.5000	0.7000	0.7700	32.9871 (74)
South	17.7400	46.7521	0.5000	0.7000	0.7700	201.1665 (78)
West	4.7100	19.6403	0.5000	0.7000	0.7700	22.4372 (80)

Solar gains	256.5908	436.3909	599.0764	751.8051	855.2540	856.0584	822.3349	743.2976	651.2597	482.4748	307.1213	219.7773	(83)
Total gains	817.9142	1015.2606	1152.3323	1289.7718	1365.1067	1348.8341	1295.9410	1215.4376	1137.7784	983.2868	837.2419	767.7206	(84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	48.7347	48.8175	48.8989	49.2849	49.3578	49.7000	49.7000	49.7639	49.5676	49.3578	49.2105	49.0575	
alpha	4.2490	4.2545	4.2599	4.2857	4.2905	4.3133	4.3133	4.3176	4.3045	4.2905	4.2807	4.2705	
util living area	0.9942	0.9853	0.9673	0.9177	0.8154	0.6464	0.4874	0.5364	0.7645	0.9422	0.9875	0.9956	(86)
MIT	19.3578	19.6297	19.9759	20.4036	20.7408	20.9307	20.9837	20.9756	20.8545	20.4011	19.7950	19.3093	(87)
Th 2	19.9291	19.9307	19.9323	19.9398	19.9412	19.9477	19.9477	19.9489	19.9452	19.9412	19.9384	19.9354	(88)
util rest of house	0.9926	0.9813	0.9580	0.8940	0.7639	0.5589	0.3770	0.4233	0.6864	0.9205	0.9834	0.9943	(89)
MIT 2	18.4414	18.7118	19.0527	19.4666	19.7663	19.9144	19.9430	19.9412	19.8648	19.4741	18.8832	18.3979	(90)
Living area fraction									FLA = Living area / (4) =				0.1236 (91)
MIT	18.5547	18.8252	19.1668	19.5824	19.8868	20.0400	20.0717	20.0691	19.9871	19.5887	18.9959	18.5105	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5547	18.8252	19.1668	19.5824	19.8868	20.0400	20.0717	20.0691	19.9871	19.5887	18.9959	18.5105	(93)

8. Space heating requirement

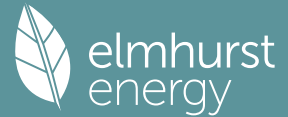
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9896	0.9756	0.9494	0.8844	0.7609	0.5671	0.3904	0.4368	0.6899	0.9113	0.9782	0.9919	(94)
Useful gains	809.4065	990.4815	1094.0135	1140.7303	1038.7425	764.8908	505.9551	530.8561	784.9585	896.0546	819.0087	761.4754	(95)
Ext temp.	4.3000	4.9000	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	2142.3040	2089.2394	1897.2724	1587.5118	1214.8360	801.6871	511.6167	540.0162	869.8958	1333.8336	1770.5237	2136.5399	(97)
Space heating kWh	991.6757	738.3653	597.6246	321.6827	131.0136	0.0000	0.0000	0.0000	0.0000	325.7076	685.0908	1023.0479	(98a)
Space heating requirement - total per year (kWh/year)												4814.2082	
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	991.6757	738.3653	597.6246	321.6827	131.0136	0.0000	0.0000	0.0000	0.0000	325.7076	685.0908	1023.0479	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4814.2082	
Space heating per m ²										(98c) / (4) =		38.0750	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1385.2634	1090.5265	1118.5622	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8461	0.9080	0.8828	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1172.1022	990.1579	987.5193	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1514.5028	1455.5156	1364.3635	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	246.5284	346.2262	280.3721	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.6321	86.5565	70.0930	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												218.2817	(107)
Energy for space heating												38.0750	(99)

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Energy for space cooling 1.7264 (108)
 Total 39.8014 (109)
 Fabric Energy Efficiency (DFEE) 39.8 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	40.0000 / (5) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (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) = 0.3180 (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	0.4054	0.3974	0.3895	0.3497	0.3418	0.3021	0.3021	0.2941	0.3180	0.3418	0.3577	0.3736 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5640	0.5698 (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
TER Opaque door			2.2200	1.0000	2.2200		(26)
TER Opening Type (Uw = 1.20)			29.4000	1.1450	33.6641		(27)
Heat Loss Floor 1			63.2200	0.1300	8.2186		(28a)
Cavity Wall	173.9100	31.6200	142.2900	0.1800	25.6122		(29a)
Joist	63.2200		63.2200	0.1100	6.9542		(30)
Total net area of external elements Aum(A, m ²)			300.3500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 76.6691		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 208.5349 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	17.6200	0.0500	0.8810
E2 Other lintels (including other steel lintels)	7.7300	0.0500	0.3865
E3 Sill	84.7200	0.0500	4.2360
E4 Jamb	34.1000	0.1600	5.4560
E5 Ground floor (normal)	34.1000	0.0000	0.0000
E6 Intermediate floor within a dwelling	30.6000	0.0900	2.7540
E16 Corner (normal)	10.2000	-0.0900	-0.9180
E17 Corner (inverted - internal area greater than external area)	19.5000	0.0600	1.1700
E10 Eaves (insulation at ceiling level)	14.6000	0.0600	0.8760
E12 Gable (insulation at ceiling level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.8415 (36)

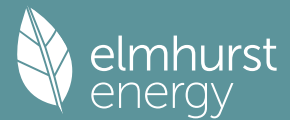
Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 91.5106 (37)

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	61.9425	61.6030	61.2702	59.7072	59.4147	58.0534	58.0534	57.8013	58.5778	59.4147	60.0063	60.6248 (38)
Heat transfer coeff	153.4531	153.1136	152.7808	151.2178	150.9254	149.5640	149.5640	149.3119	150.0884	150.9254	151.5170	152.1354 (39)
Average = Sum(39)m / 12 =												151.2164

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2136	1.2110	1.2083	1.1960	1.1937	1.1829	1.1829	1.1809	1.1870	1.1937	1.1983	1.2032 (40)
HLP (average)												1.1960
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8851 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	(42b)
Hot water usage for other uses												
44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	(42c)
Average daily hot water use (litres/day)												69.2185 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
75.5175	73.4457	71.1838	68.3688	65.8574	63.2476	62.7056	64.9629	67.2780	69.9581	72.7980	75.4116	(44)
Energy content (annual)	119.6013	104.5856	109.4068	93.5935	88.6568	77.7703	75.8369	80.4376	82.9605	94.9325	103.7140	118.0763 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1149.5721
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)
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	(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												
101.6611	88.8978	92.9958	79.5545	75.3583	66.1047	64.4614	68.3719	70.5164	80.6926	88.1569	100.3649	(62)
WWHRS	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	(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												
101.6611	88.8978	92.9958	79.5545	75.3583	66.1047	64.4614	68.3719	70.5164	80.6926	88.1569	100.3649	(64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64a)m = 977.1363 (64)
Electric shower(s)												977 (64)
58.1356	51.7993	56.5629	53.9772	54.9901	52.4552	54.2037	54.9901	53.9772	56.5629	55.4993	58.1356	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 661.2892 (64a)												
Heat gains from water heating, kWh/month												
39.9492	35.1743	37.3897	33.3829	32.5871	29.6400	29.6663	30.8405	31.1234	34.3139	35.9141	39.6251	(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	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563	144.2563 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.9748	163.8292	147.9748	152.9073	147.9748	152.9073	147.9748	147.9748	152.9073	147.9748	152.9073	147.9748 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	293.3766	296.4209	288.7493	272.4173	251.8012	232.4249	219.4803	216.4360	224.1076	240.4396	261.0557	280.4320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256	37.4256 (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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)
Water heating gains (Table 5)	53.6951	52.3427	50.2549	46.3652	43.7999	41.1667	39.8740	41.4523	43.2270	46.1208	49.8806	53.2596 (72)
Total internal gains	561.3234	578.8697	553.2559	537.9667	509.8527	492.7757	473.6060	472.1400	486.5187	500.8120	530.1205	547.9433 (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				10.6700	10.6334		0.6300		0.7000		0.7700		34.6743 (74)
South				14.8000	46.7521		0.6300		0.7000		0.7700		211.4630 (78)
West				3.9300	19.6403		0.6300		0.7000		0.7700		23.5891 (80)
Solar gains	269.7264	458.7316	629.7468	790.2956	899.0410	899.8865	864.4365	781.3527	684.6021	507.1751	322.8438	231.0282	(83)
Total gains	831.0498	1037.6013	1183.0027	1328.2623	1408.8937	1392.6622	1338.0426	1253.4927	1171.1208	1007.9871	852.9644	778.9715	(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	47.7293	47.8351	47.9393	48.4348	48.5287	48.9704	48.9704	49.0531	48.7993	48.5287	48.3392	48.1427
alpha	4.1820	4.1890	4.1960	4.2290	4.2352	4.2647	4.2647	4.2702	4.2533	4.2352	4.2226	4.2095
util living area	0.9939	0.9844	0.9652	0.9130	0.8075	0.6369	0.4794	0.5281	0.7568	0.9392	0.9868	0.9953 (86)
MIT	19.3277	19.6091	19.9651	20.4036	20.7428	20.9319	20.9839	20.9759	20.8555	20.3977	19.7786	19.2818 (87)
Th 2	19.9091	19.9112	19.9133	19.9232	19.9251	19.9337	19.9337	19.9353	19.9304	19.9251	19.9213	19.9174 (88)
util rest of house	0.9922	0.9801	0.9553	0.8881	0.7546	0.5488	0.3691	0.4150	0.6774	0.9164	0.9824	0.9940 (89)
MIT 2	18.3966	18.6766	19.0273	19.4523	19.7528	19.9013	19.9292	19.9279	19.8513	19.4574	18.8542	18.3571 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.5117	18.7919	19.1432	19.5699	19.8752	20.0287	20.0596	20.0574	19.9754	19.5737	18.9685	18.4714 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.5117	18.7919	19.1432	19.5699	19.8752	20.0287	20.0596	20.0574	19.9754	19.5737	18.9685	18.4714 (93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9890	0.9741	0.9463	0.8784	0.7519	0.5572	0.3826	0.4285	0.6812	0.9070	0.9770	0.9914	(94)
Useful gains	821.8879	1010.6759	1119.4348	1166.6950	1059.2859	775.9267	511.8713	537.1145	797.7100	914.2273	833.3418	772.2628	(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	2180.8353	2127.0334	1931.6378	1613.4833	1233.8392	811.9404	517.4271	546.0966	881.8278	1354.3516	1798.2810	2171.1929	(97)
Space heating kWh	1011.0568	750.1922	604.2790	321.6876	129.8676	0.0000	0.0000	0.0000	0.0000	327.4525	694.7562	1040.8040	(98a)
Space heating requirement - total per year (kWh/year)												4880.0960	
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	1011.0568	750.1922	604.2790	321.6876	129.8676	0.0000	0.0000	0.0000	0.0000	327.4525	694.7562	1040.8040	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4880.0960	
Space heating per m2												38.5961	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1405.9018	1106.7737	1134.7706	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8510	0.9110	0.8865	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1196.3557	1008.2343	1005.9306	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1565.7304	1504.7253	1408.8435	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	265.9498	369.3893	299.7672	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	66.4875	92.3473	74.9418	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												233.7766	(107)
Energy for space heating												38.5961	(99)
Energy for space cooling												1.8489	(108)
Total												40.4451	(109)
Fabric Energy Efficiency (TFEE)												40.4	(109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	322.4220 (5)

2. Ventilation rate

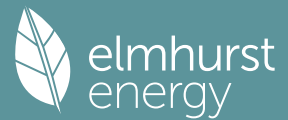
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3241 (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) = 0.2755 (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	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237	(22b)
Effective ac	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511			(27)					
Door 1.2			2.2200	1.2000	2.6640			(26)					
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000	(28a)					
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000	(29a)					
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800	(30)					
Total net area of external elements Aum(A, m2)			300.3500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.8490			(33)					
GF			87.5000			75.0000	6562.5000	(32c)					
FF			113.6700			9.0000	1023.0300	(32c)					
Internal Floor 1			63.2200			18.0000	1137.9600	(32d)					
Internal Ceiling 1			63.2200			9.0000	568.9800	(32e)					
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 26367.1500 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								208.5349 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				17.6200	0.0260	0.4581							
E3 Sill				7.7300	0.0230	0.1778							
E4 Jamb				84.7200	0.0180	1.5250							
E5 Ground floor (normal)				34.1000	0.0680	2.3188							
E6 Intermediate floor within a dwelling				34.1000	0.0010	0.0341							
E16 Corner (normal)				30.6000	0.0400	1.2240							
E17 Corner (inverted - internal area greater than external area)				10.2000	0.0320	0.3264							
E10 Eaves (insulation at ceiling level)				19.5000	0.0550	1.0725							
E12 Gable (insulation at ceiling level)				14.6000	0.0370	0.5402							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6769	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	90.5259 (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	59.7614	59.5066	59.2568	58.0837	57.8643	56.8425	56.8425	56.6533	57.2361	57.8643	58.3083	58.7725	(38)
Average = Sum(39)m / 12 =	150.2873	150.0325	149.7828	148.6097	148.3902	147.3684	147.3684	147.1792	147.7620	148.3902	148.8342	149.2984	(39)
												148.6086	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1886	1.1866	1.1846	1.1753	1.1736	1.1655	1.1655	1.1640	1.1686	1.1736	1.1771	1.1808	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

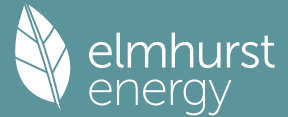
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8851	(42)
Hot water usage for mixer showers														
Hot water usage for baths	99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342	(42a)	
Hot water usage for other uses	31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	(42b)	
Average daily hot water use (litres/day)	44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	(42c)	
													161.2461	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458	(44)	
Energy content (annual)	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2678.3144		
Water storage loss:	41.6530	36.6881	38.5734	32.9199	31.2423	27.4206	26.5169	27.9704	28.7230	32.9066	36.0680	41.0649	(46)	
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5000	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)	
If cylinder contains dedicated solar storage														
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	(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	(59)	
Total heat required for water heating calculated for each month	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386	(62)	
WWHRS	-28.3932	-25.1112	-26.2950	-21.7733	-20.2919	-17.3640	-16.2759	-17.3654	-21.7973	-23.9935	-27.8674	-27.8674	(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	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718	294.2712	(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	131.0287	116.2782	124.2023	110.4221	107.9517	98.2320	97.4770	100.6989	101.1190	111.6409	117.4003	129.7252	(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	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	31.0582	27.5857	22.4342	16.9841	12.6958	10.7183	11.5815	15.0541	20.2056	25.6557	29.9440	31.9214	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	437.8755	442.4193	430.9691	406.5931	375.8226	346.9028	327.5826	323.0388	334.4890	358.8650	389.6354	418.5553	(68)	
Pumps, fans	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	(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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	(71)	
Total internal gains	176.1138	173.0330	166.9386	153.3641	145.0964	136.4333	131.0174	135.3480	140.4430	150.0550	163.0560	174.3618	(72)	
	760.9459	758.9363	736.2403	692.8396	649.5133	606.9529	583.0799	586.3393	608.0360	650.4741	698.5338	740.7369	(73)	

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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	12.7900		10.6334		0.5000		0.7000		0.7700		32.9871 (74)	
South	17.7400		46.7521		0.5000		0.7000		0.7700		201.1665 (78)	
West	4.7100		19.6403		0.5000		0.7000		0.7700		22.4372 (80)	
Solar gains	256.5908	436.3909	599.0764	751.8051	855.2540	856.0584	822.3349	743.2976	651.2597	482.4748	307.1213	219.7773 (83)
Total gains	1017.5367	1195.3272	1335.3167	1444.6448	1504.7673	1463.0113	1405.4148	1329.6369	1259.2957	1132.9489	1005.6551	960.5142 (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	48.7347	48.8175	48.8989	49.2849	49.3578	49.7000	49.7000	49.7639	49.5676	49.3578	49.2105	49.0575
alpha	4.2490	4.2545	4.2599	4.2857	4.2905	4.3133	4.3133	4.3176	4.3045	4.2905	4.2807	4.2705
util living area	0.9871	0.9740	0.9474	0.8878	0.7743	0.6065	0.4524	0.4952	0.7175	0.9123	0.9760	0.9897 (86)
MIT	19.8344	20.0187	20.2687	20.5525	20.7715	20.8876	20.9191	20.9149	20.8436	20.5568	20.1366	19.7951 (87)
Th 2	19.9291	19.9307	19.9323	19.9398	19.9412	19.9477	19.9477	19.9489	19.9452	19.9412	19.9384	19.9354 (88)
util rest of house	0.9836	0.9673	0.9337	0.8585	0.7188	0.5208	0.3485	0.3886	0.6367	0.8828	0.9686	0.9869 (89)
MIT 2	18.5801	18.8135	19.1259	19.4733	19.7168	19.8312	19.8524	19.8517	19.7951	19.4881	18.9710	18.5351 (90)
Living area fraction	18.7352	18.9625	19.2671	19.6067	19.8472	19.9618	19.9843	19.9831	fLA = Living area / (4) =	19.6202	19.1151	0.1236 (91)
MIT	18.7352	18.9625	19.2671	19.6067	19.8472	19.9618	19.9843	19.9831	19.9247	19.6202	19.1151	18.6908 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7352	18.9625	19.2671	19.6067	19.8472	19.9618	19.9843	19.9831	19.9247	19.6202	19.1151	18.6908 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9783	0.9593	0.9230	0.8478	0.7134	0.5220	0.3522	0.3922	0.6350	0.8719	0.9609	0.9824 (94)
Useful gains	995.4658	1146.6758	1232.5221	1224.7306	1073.4849	763.6615	495.0349	521.4516	799.6269	987.7761	966.3219	943.6219 (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	2169.4201	2109.8248	1912.2946	1591.1175	1208.9595	790.1587	498.7381	527.3652	860.6747	1338.5082	1788.2626	2163.4553 (97)
Space heating kWh	873.4220	647.2362	505.7507	263.7985	100.7931	0.0000	0.0000	0.0000	0.0000	260.9447	591.7972	907.5561 (98a)
Space heating requirement - total per year (kWh/year)												4151.2985
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	873.4220	647.2362	505.7507	263.7985	100.7931	0.0000	0.0000	0.0000	0.0000	260.9447	591.7972	907.5561 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4151.2985
Space heating per m2										(98c) / (4) =		32.8322 (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 %)												88.8000 (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	873.4220	647.2362	505.7507	263.7985	100.7931	0.0000	0.0000	0.0000	0.0000	260.9447	591.7972	907.5561 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	983.5833	728.8695	569.5391	297.0704	113.5057	0.0000	0.0000	0.0000	0.0000	293.8567	666.4383	1022.0226 (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	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718	294.2712 (64)
Efficiency of water heater	86.3253	85.9964	85.3749	84.2305	82.2934	79.8000	79.8000	79.8000	79.8000	84.1871	85.8199	79.8000 (216)
Fuel for water heating, kWh/month	344.8184	306.0211	327.0675	290.2810	287.2193	265.9803	261.7488	272.5987	276.1070	292.8842	306.7724	340.5377 (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	27.1851	21.8089	19.6365	14.3865	11.1126	9.0791	10.1373	13.1768	17.1154	22.4563	25.3643	27.9407 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-60.6544	-88.1800	-129.8663	-144.0666	-149.8697	-137.3427	-135.1524	-130.1103	-118.7379	-100.6126	-67.0058	-51.6184 (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)	-42.1253	-99.5019	-229.1708	-388.4110	-548.2005	-564.4106	-550.8800	-443.2569	-293.7249	-150.3655	-58.1813	-32.1333 (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)

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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												4674.8857	(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												3572.0364	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump												41.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												219.3993	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-4713.5792	(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												3838.7422	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4674.8857	3.6400	170.1658	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3572.0364	3.6400	130.0221	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	219.3993	16.4900	36.1789	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1313.2171	16.4900	-216.5495	
PV Unit electricity exported	-3400.3621	5.5900	-190.0802	
Total			-406.6297	(252)
Total energy cost			35.9186	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.0754	(257)
SAP value		98.7774	
SAP rating (Section 12)		99	(258)
SAP band		A	

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

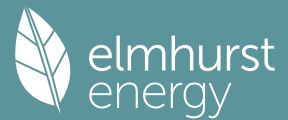
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4674.8857	0.2100	981.7260	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3572.0364	0.2100	750.1276	(264)
Space and water heating			1731.8536	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	219.3993	0.1443	31.6661	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1313.2171	0.1348	-177.0057	
PV Unit electricity exported	-3400.3621	0.1230	-418.3660	
Total			-595.3718	(269)
Total CO2, kg/year			1180.0772	(272)
CO2 emissions per m2			9.3300	(273)
EI value			90.7763	
EI rating			91	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	63.2200	(1b)	x	2.4000	(2b)	= 151.7280 (1b) - (3b)
First floor	63.2200	(1c)	x	2.7000	(2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 322.4220 (5)

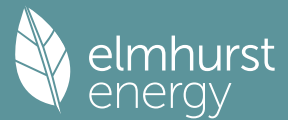
Full SAP Calculation Printout



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) =	0.1241 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											4.0000 (17)		
Infiltration rate											0.3241 (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) = 0.2755 (21)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj inflt rate	0.2892	0.2755	0.2755	0.2548	0.2548	0.2272	0.2341	0.2204	0.2272	0.2410	0.2410	0.2617	(22b)
Effective ac	0.5418	0.5379	0.5379	0.5325	0.5325	0.5258	0.5274	0.5243	0.5258	0.5290	0.5290	0.5342	(25)

Full SAP Calculation Printout



If cylinder contains dedicated solar storage											
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	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											
WWHRS	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653 (62)
PV diverter	-28.3932	-25.1112	-26.2950	-21.7733	-20.2919	-17.3640	-16.2759	-17.3078	-17.9654	-21.1793	-23.9935 (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 (63b)
FGHRS	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 (63d)
	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718 (64)
Total per year (kWh/year) = Sum(64)m =											2984.0423 (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 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month											
	131.0287	116.2782	124.2023	110.4221	107.9517	98.2320	97.4770	100.6989	101.1190	111.6409	117.4003 (65)
	129.7252										

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

Metabolic gains (Table 5), Watts											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
(66)m	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0582	27.5857	22.4342	16.9841	12.6958	10.7183	11.5815	15.0541	20.2056	25.6557	29.9440 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	437.8755	442.4193	430.9691	406.5931	375.8226	346.9028	327.5826	323.0388	334.4890	358.8650	389.6354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959 (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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)
Water heating gains (Table 5)	176.1138	173.0330	166.9386	153.3641	145.0964	136.4333	131.0174	135.3480	140.4430	150.0550	163.0560 (72)
Total internal gains	760.9459	758.9363	736.2403	692.8396	649.5133	606.9529	583.0799	586.3393	608.0360	650.4741	698.5338 (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					12.7900	11.9814	0.5000	0.7000			0.7700	37.1690 (74)
South					17.7400	50.9848	0.5000	0.7000			0.7700	219.3794 (78)
West					4.7100	22.3313	0.5000	0.7000			0.7700	25.5115 (80)
Solar gains	282.0599	431.8152	587.3146	764.4816	852.3805	915.4404	868.8993	799.2299	693.6406	510.1112	345.8631	239.2841 (83)
Total gains	1043.0058	1190.7515	1323.5549	1457.3212	1501.8938	1522.3933	1451.9792	1385.5692	1301.6766	1160.5854	1044.3969	980.0210 (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	49.4292	49.5676	49.5676	49.7639	49.7639	50.0039	49.9462	50.0599	50.0039	49.8870	49.8870	49.7000
alpha	4.2953	4.3045	4.3045	4.3176	4.3176	4.3336	4.3297	4.3373	4.3336	4.3258	4.3258	4.3133
util living area	0.9829	0.9697	0.9365	0.8552	0.7024	0.4704	0.3117	0.3359	0.6129	0.8752	0.9652	0.9863 (86)
MIT	19.9586	20.1111	20.3669	20.6457	20.8390	20.9168	20.9271	20.9267	20.8909	20.6626	20.2711	19.9242 (87)
Th 2	19.9425	19.9452	19.9452	19.9489	19.9489	19.9534	19.9523	19.9544	19.9534	19.9512	19.9512	19.9477 (88)
util rest of house	0.9782	0.9616	0.9194	0.8179	0.6335	0.3768	0.2071	0.2272	0.5177	0.8338	0.9542	0.9825 (89)
MIT 2	18.7481	18.9413	19.2574	19.5882	19.7902	19.8567	19.8605	19.8626	19.8409	19.6175	19.1493	18.7089 (90)
Living area fraction	0.9782	0.9616	0.9194	0.8179	0.6335	0.3768	0.2071	0.2272	0.5177	0.8338	0.9542	0.9825 (89)
MIT	18.8978	19.0859	19.3945	19.7190	19.9199	19.9878	19.9923	19.9941	19.9707	19.7467	19.2880	18.8591 (92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	18.8978	19.0859	19.3945	19.7190	19.9199	19.9878	19.9923	19.9941	19.9707	19.7467	19.2880	18.8591 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9720	0.9531	0.9085	0.8085	0.6314	0.3799	0.2111	0.2314	0.5194	0.8243	0.9451	0.9771 (94)
Useful gains	1013.8101	1134.8797	1202.4522	1178.2789	948.2911	578.3984	306.5312	320.5890	676.1190	956.6170	987.0863	957.5465 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	2044.4943	1992.7085	1772.3348	1445.1480	1018.4603	584.0998	306.8202	321.0231	698.7832	1196.0586	1657.2553	2027.6626 (97)
Space heating kWh	766.8291	576.4610	423.9926	192.1457	52.2059	0.0000	0.0000	0.0000	0.0000	178.1445	482.5216	796.1664 (98a)
Space heating requirement - total per year (kWh/year)												3468.4668
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	766.8291	576.4610	423.9926	192.1457	52.2059	0.0000	0.0000	0.0000	0.0000	178.1445	482.5216	796.1664 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3468.4668
Space heating per m ²												27.4317 (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)

elmhurst
energy

[illegible]

Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	219.3993	(232)

10a. Fuel costs - using BEDF prices (560)			
	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3905.9311	5.6000	218.7321 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3586.6838	5.6000	200.8543 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	219.3993	26.0600	57.1755 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1352.4548	26.0600	-352.4497
PV Unit electricity exported	-3687.6385	5.8100	-214.2518
Total			-566.7015 (252)
Total energy cost			31.4720 (255)

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	3905.9311	0.2100	820.2455 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	3586.6838	0.2100	753.2036 (264)
Space and water heating			1573.4491 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	219.3993	0.1443	31.6661 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1352.4548	0.1350	-182.6449
PV Unit electricity exported	-3687.6385	0.1227	-452.3960
Total			-635.0409 (269)
Total CO ₂ . kg/year			982.0036 (272)

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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	3905.9311	1.1300	4413.7022 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3586.6838	1.1300	4052.9527 (278)
Space and water heating			8466.6549 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	219.3993	1.5338	336.5219 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1352.4548	1.4991	-2027.5171
PV Unit electricity exported	-3687.6385	0.4501	-1659.8059
Total			-3687.3230 (283)
Total Primary energy kWh/year			5245.9547 (286)

SAP 10 EPC IMPROVEMENTS

Be Lean Act

Current energy efficiency rating:	A 99
Current environmental impact rating:	B 91

N Solar water heating	SAP increase too small
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

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

Measures omitted - SAP change or cost saving too small:	
N Solar water heating	+ 0.9 -£ 44 -216 kg (22.0%)

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

Potential energy efficiency rating:	A 99
Potential environmental impact rating:	B 91

Fuel prices for cost data on this page from database revision number 560 TEST (06 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£80	£80	£0
Mains gas	£519	£519	£0
Space heating	£340	£340	£0
Water heating	£201	£201	£0
Lighting	£57	£57	£0
Generated (PV)	-£567	-£567	£0
Total cost of fuels	£32	£32	£0
Total cost of uses	£31	£31	£0
Delivered energy	22 kWh/m²	22 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	41 kWh/m²	41 kWh/m²	0 kWh/m²

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

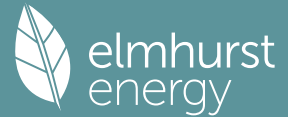
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220 (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)

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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) =	0.1241 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3241	(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) =	0.2755 (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)
Effective ac	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237	(22b)
	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524	(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	
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511			(27)
Door 1.2			2.2200	1.2000	2.6640			(26)
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000	(28a)
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000	(29a)
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800	(30)
Total net area of external elements Aum (A, m2)			300.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.8490			(33)
GF			87.5000			75.0000	6562.5000	(32c)
FF			113.6700			9.0000	1023.0300	(32c)
Internal Floor 1			63.2200			18.0000	1137.9600	(32d)
Internal Ceiling 1			63.2200			9.0000	568.9800	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 26367.1500 (34)
208.5349 (35)

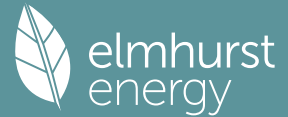
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	17.6200	0.0260	0.4581	
E2 Other lintels (including other steel lintels)	7.7300	0.0230	0.1778	
E3 Sill	84.7200	0.0180	1.5250	
E4 Jamb	34.1000	0.0680	2.3188	
E5 Ground floor (normal)	34.1000	0.0010	0.0341	
E6 Intermediate floor within a dwelling	30.6000	0.0400	1.2240	
E16 Corner (normal)	10.2000	0.0320	0.3264	
E17 Corner (inverted - internal area greater than external area)	19.5000	0.0550	1.0725	
E10 Eaves (insulation at ceiling level)	14.6000	0.0370	0.5402	
E12 Gable (insulation at ceiling level)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.6769	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	90.5259 (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	59.7614	59.5066	59.2568	58.0837	57.8643	56.8425	56.8425	56.6533	57.2361	57.8643	58.3083	58.7725	(38)
Average = Sum(39)m / 12 =	150.2873	150.0325	149.7828	148.6097	148.3902	147.3684	147.3684	147.1792	147.7620	148.3902	148.8342	149.2984	(39)
												148.6086	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1886	1.1866	1.1846	1.1753	1.1736	1.1655	1.1655	1.1640	1.1686	1.1736	1.1771	1.1808	(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													2.8851 (42)
Hot water usage for mixer showers													
Hot water usage for baths	99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342	(42a)
Hot water usage for other uses	31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350	(42b)
Average daily hot water use (litres/day)	44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766	(42c)
												161.2461	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458	(44)
Energy content (annual)	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	41.6530	36.6881	38.5734	32.9199	31.2423	27.4206	26.5169	27.9704	28.7230	32.9066	36.0680	41.0649	(46)
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss													
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
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	(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	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386	(62)
WWHRS	-28.3932	-25.1112	-26.2950	-21.7733	-20.2919	-17.3640	-16.2759	-17.3078	-17.9654	-21.1793	-23.9935	-27.8674	(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													

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	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718	294.2712 (64)
	Total per year (kWh/year) = Sum(64)m =											2984.0423 (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	131.0287	116.2782	124.2023	110.4221	107.9517	98.2320	97.4770	100.6989	101.1190	111.6409	117.4003	129.7252 (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	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0582	27.5857	22.4342	16.9841	12.6958	10.7183	11.5815	15.0541	20.2056	25.6557	29.9440	31.9214	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	437.8755	442.4193	430.9691	406.5931	375.8226	346.9028	327.5826	323.0388	334.4890	358.8650	389.6354	418.5553	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	(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)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	(71)
Water heating gains (Table 5)	176.1138	173.0330	166.9386	153.3641	145.0964	136.4333	131.0174	135.3480	140.4430	150.0550	163.0560	174.3618	(72)
Total internal gains	760.9459	758.9363	736.2403	692.8396	649.5133	606.9529	583.0799	586.3393	608.0360	650.4741	698.5338	740.7369	(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	12.7900	10.6334	0.5000	0.7000	0.7700	32.9871	(74)
South	17.7400	46.7521	0.5000	0.7000	0.7700	201.1665	(78)
West	4.7100	19.6403	0.5000	0.7000	0.7700	22.4372	(80)

Solar gains	256.5908	436.3909	599.0764	751.8051	855.2540	856.0584	822.3349	743.2976	651.2597	482.4748	307.1213	219.7773	(83)
Total gains	1017.5367	1195.3272	1335.3167	1444.6448	1504.7673	1463.0113	1405.4148	1329.6369	1259.2957	1132.9489	1005.6551	960.5142	(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	48.7347	48.8175	48.8989	49.2849	49.3578	49.7000	49.7000	49.7639	49.5676	49.3578	49.2105	49.0575
alpha	4.2490	4.2545	4.2599	4.2857	4.2905	4.3133	4.3133	4.3176	4.3045	4.2905	4.2807	4.2705
util living area	0.9871	0.9740	0.9474	0.8878	0.7743	0.6065	0.4524	0.4952	0.7175	0.9123	0.9760	0.9897 (86)
MIT	19.8344	20.0187	20.2687	20.5525	20.7715	20.8876	20.9191	20.9149	20.8436	20.5568	20.1366	19.7951 (87)
Th 2	19.9291	19.9307	19.9323	19.9398	19.9412	19.9477	19.9477	19.9489	19.9452	19.9412	19.9384	19.9354 (88)
util rest of house	0.9836	0.9673	0.9337	0.8585	0.7188	0.5208	0.3485	0.3886	0.6367	0.8828	0.9686	0.9869 (89)
MIT 2	18.5801	18.8135	19.1259	19.4733	19.7168	19.8312	19.8524	19.8517	19.7951	19.4881	18.9710	18.5351 (90)
Living area fraction	18.7352	18.9625	19.2671	19.6067	19.8472	19.9618	19.9843	19.9831	fLA = Living area / (4) =	19.9247	19.6202	19.1151 0.1236 (91)
MIT	18.7352	18.9625	19.2671	19.6067	19.8472	19.9618	19.9843	19.9831	19.9247	19.6202	19.1151	18.6908 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7352	18.9625	19.2671	19.6067	19.8472	19.9618	19.9843	19.9831	19.9247	19.6202	19.1151	18.6908 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9783	0.9593	0.9230	0.8478	0.7134	0.5220	0.3522	0.3922	0.6350	0.8719	0.9609	0.9824	(94)	
Useful gains	995.4658	1146.6758	1232.5221	1224.7306	1073.4849	763.6615	495.0349	521.4516	799.6269	987.7761	966.3219	943.6219	(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	2169.4201	2109.8248	1912.2946	1591.1175	1208.9595	790.1587	498.7381	527.3652	860.6747	1338.5082	1788.2626	2163.4553	(97)	
Space heating kWh	873.4220	647.2362	505.7507	263.7985	100.7931	0.0000	0.0000	0.0000	0.0000	260.9447	591.7972	907.5561	(98a)	
Space heating requirement - total per year (kWh/year)	4151.2985													
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	873.4220	647.2362	505.7507	263.7985	100.7931	0.0000	0.0000	0.0000	0.0000	260.9447	591.7972	907.5561	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	4151.2985													
Space heating per m2											(98c) / (4) =		32.8322	(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 %)												88.8000 (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	873.4220	647.2362	505.7507	263.7985	100.7931	0.0000	0.0000	0.0000	0.0000	260.9447	591.7972	907.5561	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	983.5833	728.8695	569.5391	297.0704	113.5057	0.0000	0.0000	0.0000	0.0000	293.8567	666.4383	1022.0226	(211)

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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	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718	294.2712 (64)
Efficiency of water heater	86.3253	85.9964	85.3749	84.2305	82.2934	79.8000	79.8000	79.8000	79.8000	84.1871	85.8199	79.8000 (216)
Fuel for water heating, kWh/month	344.8184	306.0211	327.0675	290.2810	287.2193	265.9803	261.7488	272.5987	276.1070	292.8842	306.7724	86.4137 (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	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	27.1851	21.8089	19.6365	14.3865	11.1126	9.0791	10.1373	13.1768	17.1154	22.4563	25.3643	27.9407 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-60.6544	-88.1800	-129.8663	-144.0666	-149.8697	-137.3427	-135.1524	-130.1103	-118.7379	-100.6126	-67.0058	-51.6184 (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)	-42.1253	-99.5019	-229.1708	-388.4110	-548.2005	-564.4106	-550.8800	-443.2569	-293.7249	-150.3655	-58.1813	-32.1333 (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												4674.8857 (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												3572.0364 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												219.3993 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4713.5792 (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												3838.7422 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4674.8857	3.6400	170.1658 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3572.0364	3.6400	130.0221 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	219.3993	16.4900	36.1789 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1313.2171	16.4900	-216.5495
PV Unit electricity exported	-3400.3621	5.5900	-190.0802
Total			-406.6297 (252)
Total energy cost			35.9186 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.0754 (257)
SAP value		98.7774
SAP rating (Section 12)		99 (258)
SAP band		A

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	4674.8857	0.2100	981.7260 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3572.0364	0.2100	750.1276 (264)
Space and water heating			1731.8536 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	219.3993	0.1443	31.6661 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1313.2171	0.1348	-177.0057
PV Unit electricity exported	-3400.3621	0.1230	-418.3660
Total			-595.3718 (269)
Total CO2, kg/year			1180.0772 (272)
CO2 emissions per m2			9.3300 (273)
EI value			90.7763

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EI rating
EI band

91 (274)
B

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.2200 (1b)	x 2.4000 (2b)	= 151.7280 (1b) - (3b)
First floor	63.2200 (1c)	x 2.7000 (2c)	= 170.6940 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 322.4220 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3241 (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) = 0.2755 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2892	0.2755	0.2755	0.2548	0.2548	0.2272	0.2341	0.2204	0.2272	0.2410	0.2410	0.2617 (22b)
Effective ac	0.5418	0.5379	0.5379	0.5325	0.5325	0.5258	0.5274	0.5243	0.5258	0.5290	0.5290	0.5342 (25)

3. Heat losses and heat loss parameter

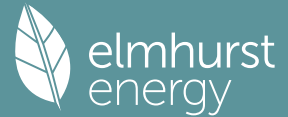
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window 1.2 (Uw = 1.20)			35.2400	1.1450	40.3511		(27)
Door 1.2			2.2200	1.2000	2.6640		(26)
Heat Loss Floor 1			63.2200	0.1100	6.9542	110.0000	6954.2000 (28a)
Cavity Wall	173.9100	37.4600	136.4500	0.1900	25.9255	70.0000	9551.5000 (29a)
Joist	63.2200		63.2200	0.1100	6.9542	9.0000	568.9800 (30)
Total net area of external elements Aum(A, m ²)			300.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.8490		(33)
GF			87.5000			75.0000	6562.5000 (32c)
FF			113.6700			9.0000	1023.0300 (32c)
Internal Floor 1			63.2200			18.0000	1137.9600 (32d)
Internal Ceiling 1			63.2200			9.0000	568.9800 (32e)

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

	Length	Psi-value	Total
K1 Element	17.6200	0.0260	0.4581
E2 Other lintels (including other steel lintels)	7.7300	0.0230	0.1778
E3 Sill	84.7200	0.0180	1.5250
E4 Jamb	34.1000	0.0680	2.3188
E5 Ground floor (normal)	34.1000	0.0010	0.0341
E6 Intermediate floor within a dwelling	30.6000	0.0400	1.2240
E16 Corner (normal)	10.2000	0.0320	0.3264
E17 Corner (inverted - internal area greater than external area)	19.5000	0.0550	1.0725
E10 Eaves (insulation at ceiling level)	14.6000	0.0370	0.5402
E12 Gable (insulation at ceiling level)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.6769 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	90.5259 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	57.6498	57.2361	57.2361	56.6533	56.6533	55.9469	56.1160	55.7830	55.9469	56.2900	56.2900	56.8425 (38)
Heat transfer coeff	148.1757	147.7620	147.7620	147.1792	147.1792	146.4729	146.6419	146.3089	146.4729	146.8160	146.8160	147.3684 (39)
Average = Sum(39)m / 12 =												147.0796
HLP	1.1719	1.1686	1.1686	1.1640	1.1640	1.1584	1.1598	1.1571	1.1584	1.1612	1.1612	1.1655 (40)
HLP (average)												1.1632
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8851 (42)
Hot water usage for mixer showers	99.8166	98.3166	96.1307	91.9484	88.8620	85.4201	83.4637	85.6330	88.0110	91.7066	95.9787	99.4342 (42a)
Hot water usage for baths	31.3410	30.8755	30.2201	29.0115	28.1065	27.1031	26.5611	27.2120	27.9207	28.9944	30.2278	31.2350 (42b)
Hot water usage for other uses	44.1766	42.5701	40.9637	39.3573	37.7509	36.1445	36.1445	37.7509	39.3573	40.9637	42.5701	44.1766 (42c)
Average daily hot water use (litres/day)												161.2461 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	175.3342	171.7622	167.3145	160.3172	154.7195	148.6677	146.1693	150.5959	155.2890	161.6647	168.7767	174.8458 (44)
Energy content (annual)	277.6864	244.5871	257.1561	219.4663	208.2821	182.8042	176.7791	186.4692	191.4868	219.3775	240.4533	273.7662 (45)
Distribution loss (46)m = 0.15 x (45)m	41.6530	36.6881	38.5734	32.9199	31.2423	27.4206	26.5169	27.9704	28.7230	32.9066	36.0680	41.0649 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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	326.0588	288.2783	305.5285	266.2783	256.6545	229.6162	225.1515	234.8416	238.2988	267.7499	287.2653	322.1386 (62)
WWHRS	-28.3932	-25.1112	-26.2950	-21.7733	-20.2919	-17.3640	-16.2759	-17.3078	-17.9654	-21.1793	-23.9935	-27.8674 (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	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718	294.2712 (64)
	Total per year (kWh/year) = Sum(64)m =											2984.0423 (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	131.0287	116.2782	124.2023	110.4221	107.9517	98.2320	97.4770	100.6989	101.1190	111.6409	117.4003	129.7252 (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	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075	173.1075 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0582	27.5857	22.4342	16.9841	12.6958	10.7183	11.5815	15.0541	20.2056	25.6557	29.9440	31.9214 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	437.8755	442.4193	430.9691	406.5931	375.8226	346.9028	327.5826	323.0388	334.4890	358.8650	389.6354	418.5553 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959	55.1959 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050	-115.4050 (71)
Water heating gains (Table 5)	176.1138	173.0330	166.9386	153.3641	145.0964	136.4333	131.0174	135.3480	140.4430	150.0550	163.0560	174.3618 (72)
Total internal gains	760.9459	758.9363	736.2403	692.8396	649.5133	606.9529	583.0799	586.3393	608.0360	650.4741	698.5338	740.7369 (73)

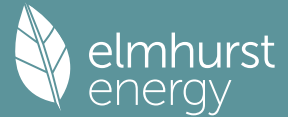
6. Solar gains

[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				12.7900	11.9814		0.5000		0.7000		0.7700		37.1690 (74)
South				17.7400	50.9848		0.5000		0.7000		0.7700		219.3794 (78)
West				4.7100	22.3313		0.5000		0.7000		0.7700		25.5115 (80)
Solar gains	282.0599	431.8152	587.3146	764.4816	852.3805	915.4404	868.8993	799.2299	693.6406	510.1112	345.8631	239.2841	(83)
Total gains	1043.0058	1190.7515	1323.5549	1457.3212	1501.8938	1522.3933	1451.9792	1385.5692	1301.6766	1160.5854	1044.3969	980.0210	(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	49.4292	49.5676	49.5676	49.7639	49.7639	50.0039	49.9462	50.0599	50.0039	49.8870	49.8870	49.7000
alpha	4.2953	4.3045	4.3045	4.3176	4.3176	4.3336	4.3297	4.3373	4.3336	4.3258	4.3258	4.3133
util living area	0.9829	0.9697	0.9365	0.8552	0.7024	0.4704	0.3117	0.3359	0.6129	0.8752	0.9652	0.9863 (86)
MIT	19.9586	20.1111	20.3669	20.6457	20.8390	20.9168	20.9271	20.9267	20.8909	20.6626	20.2711	19.9242 (87)
Th 2	19.9425	19.9452	19.9452	19.9489	19.9489	19.9534	19.9523	19.9544	19.9534	19.9512	19.9512	19.9477 (88)
util rest of house	0.9782	0.9616	0.9194	0.8179	0.6335	0.3768	0.2071	0.2272	0.5177	0.8338	0.9542	0.9825 (89)
MIT 2	18.7481	18.9413	19.2574	19.5882	19.7902	19.8567	19.8605	19.8626	19.8409	19.6175	19.1493	18.7089 (90)
Living area fraction	18.8978	19.0859	19.3945	19.7190	19.9199	19.9878	19.9923	19.9941	fLA = Living area / (4) = 19.9707	19.7467	19.2880	0.1236 (91)
MIT	18.8978	19.0859	19.3945	19.7190	19.9199	19.9878	19.9923	19.9941	19.9707	19.7467	19.2880	18.8591 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8978	19.0859	19.3945	19.7190	19.9199	19.9878	19.9923	19.9941	19.9707	19.7467	19.2880	18.8591 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9531	0.9085	0.8085	0.6314	0.3799	0.2111	0.2314	0.5194	0.8243	0.9451	0.9771	(94)
Useful gains	1013.8101	1134.8797	1202.4522	1178.2789	948.2911	578.3984	306.5312	320.5890	676.1190	956.6170	987.0863	957.5465	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	2044.4943	1992.7085	1772.3348	1445.1480	1018.4603	584.0998	306.8202	321.0231	698.7832	1196.0586	1657.2553	2027.6626	(97)
Space heating kWh	766.8291	576.4610	423.9926	192.1457	52.2059	0.0000	0.0000	0.0000	0.0000	178.1445	482.5216	796.1664	(98a)
Space heating requirement - total per year (kWh/year)												3468.4668	
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	766.8291	576.4610	423.9926	192.1457	52.2059	0.0000	0.0000	0.0000	0.0000	178.1445	482.5216	796.1664	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3468.4668	
Space heating per m2										(98c) / (4) =		27.4317	(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 %)												88.8000	(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	766.8291	576.4610	423.9926	192.1457	52.2059	0.0000	0.0000	0.0000	0.0000	178.1445	482.5216	796.1664	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	863.5462	649.1678	477.4692	216.3803	58.7904	0.0000	0.0000	0.0000	0.0000	200.6132	543.3802	896.5838	(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	297.6656	263.1671	279.2335	244.5050	236.3626	212.2523	208.8755	217.5337	220.3334	246.5706	263.2718	294.2712	(64)
Efficiency of water heater (217)m	86.0851	85.7681	84.9937	83.5251	81.2905	79.8000	79.8000	79.8000	79.8000	83.3430	85.4000	79.8000	(216)
Fuel for water heating, kWh/month	345.7806	306.8355	328.5342	292.7322	290.7628	265.9803	261.7488	272.5987	276.1070	295.8504	308.2809	341.4725	(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	27.1851	21.8089	19.6365	14.3865	11.1126	9.0791	10.1373	13.1768	17.1154	22.4563	25.3643	27.9407	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-66.9087	-89.8495	-130.9099	-146.1073	-150.3186	-139.0032	-136.6317	-132.9074	-122.7726	-105.7656	-74.5767	-56.7035	(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	-50.8594	-103.6835	-234.1878	-409.9564	-557.7202	-621.6539	-599.3905	-497.7411	-331.2833	-170.4506	-72.3988	-38.3131	(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												3905.9311	(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												3586.6838	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												219.3993	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5040.0933	(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												2757.9209	(238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3905.9311	5.6000	218.7321	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3586.6838	5.6000	200.8543	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	219.3993	26.0600	57.1755	(250)

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Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1352.4548	26.0600	-352.4497
PV Unit electricity exported	-3687.6385	5.8100	-214.2518
Total			-566.7015 (252)
Total energy cost			31.4720 (255)

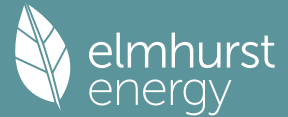
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3905.9311	0.2100	820.2455 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3586.6838	0.2100	753.2036 (264)
Space and water heating			1573.4491 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	219.3993	0.1443	31.6661 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1352.4548	0.1350	-182.6449
PV Unit electricity exported	-3687.6385	0.1227	-452.3960
Total			-635.0409 (269)
Total CO2, kg/year			982.0036 (272)

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	3905.9311	1.1300	4413.7022 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3586.6838	1.1300	4052.9527 (278)
Space and water heating			8466.6549 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	219.3993	1.5338	336.5219 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1352.4548	1.4991	-2027.5171
PV Unit electricity exported	-3687.6385	0.4501	-1659.8059
Total			-3687.3230 (283)
Total Primary energy kWh/year			5245.9547 (286)

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Property Reference	House Type B				Issued on Date	29/01/2025	
Assessment Reference	Be lean Act			Prop Type Ref			
Property							
SAP Rating	98 A	DER	9.84	TER	10.10		
Environmental	92 A	% DER < TER				2.57	
CO ₂ Emissions (t/year)	0.75	DFEE	32.71	TFEE	34.48		
Compliance Check	See BREL	% DFEE < TFEE				5.14	
% DPER < TPER	1.27	DPER	51.82	TPER	52.48		
Assessor Details	Mr. James Rivers				Assessor ID	R423-0001	
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)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (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) = 0.1258 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3258 (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) = 0.2770 (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	0.3531	0.3462	0.3393	0.3046	0.2977	0.2631	0.2631	0.2562	0.2770	0.2977	0.3116	0.3254 (22b)
Effective ac	0.5623	0.5599	0.5576	0.5464	0.5443	0.5346	0.5346	0.5328	0.5384	0.5443	0.5485	0.5529 (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
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000 (28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800 (29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500 (30)
Total net area of external elements Aum(A, m ²)			192.5440				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	50.7053			(33)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000 (32)
GF			92.6800			75.0000	6951.0000 (32c)
FF			100.4900			9.0000	904.4100 (32c)
Internal Floor 1			46.7500			18.0000	841.5000 (32d)
Internal Ceiling 1			46.7500			9.0000	420.7500 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				22063.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.9764 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.6400	0.0260	0.2766	
E3 Sill				4.9000	0.0230	0.1127	

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E4 Jamb	54.7600	0.0180	0.9857
E5 Ground floor (normal)	19.4200	0.0680	1.3206
E6 Intermediate floor within a dwelling	19.4200	0.0010	0.0194
E16 Corner (normal)	10.2000	0.0400	0.4080
E18 Party wall between dwellings	10.2000	0.0320	0.3264
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672
P1 Party wall - Ground floor	8.8200	0.0580	0.5116
E10 Eaves (insulation at ceiling level)	10.6000	0.0550	0.5830
E12 Gable (insulation at ceiling level)	8.8200	0.0370	0.3263
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.0330	0.2911

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.2286 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 55.9338 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 (38)m Jan 44.2454 Feb 44.0549 Mar 43.8682 Apr 42.9913 May 42.8272 Jun 42.0634 Jul 42.0634 Aug 41.9220 Sep 42.3576 Oct 42.8272 Nov 43.1591 Dec 43.5061 (38)
 Heat transfer coeff 100.1793 99.9888 99.8021 98.9251 98.7610 97.9972 97.9972 97.8558 98.2914 98.7610 99.0930 99.4400 (39)
 Average = Sum(39)m / 12 = 98.9243

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0714	1.0694	1.0674	1.0580	1.0563	1.0481	1.0481	1.0466	1.0512	1.0563	1.0598	1.0635 (40)
HLP (average)												1.0580
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6707 (42)
Hot water usage for mixer showers	94.8722	93.4465	91.3689	87.3938	84.4603	81.1888	79.3294	81.3912	83.6514	87.1639	91.2244	94.5087 (42a)
Hot water usage for baths	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939 (42b)
Hot water usage for other uses	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802 (42c)
Average daily hot water use (litres/day)												153.2572 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	166.6471	163.2523	159.0250	152.3745	147.0541	141.3022	138.9274	143.1346	147.5950	153.6549	160.4145	166.1829 (44)
Energy content (annual)	263.9282	232.4691	244.4155	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022 (45)
Distribution loss (46)m = 0.15 x (45)m	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746 (62)
WWHRS	-26.9868	-23.8673	-24.9925	-20.6948	-19.2868	-16.5038	-15.4697	-16.4505	-17.0755	-20.1301	-22.8050	-26.4870 (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	285.3139	252.2930	267.7954	234.7102	227.0487	204.0556	200.9233	209.1524	211.7359	236.7505	252.5468	282.0876 (64)
12Total per year (kWh/year)												2864.4134 (64)
Electric shower(s)												2864 (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	126.4541	112.2489	119.9661	106.8068	104.5206	95.2206	94.5648	97.6271	97.9644	108.0269	113.4391	125.2152 (65)

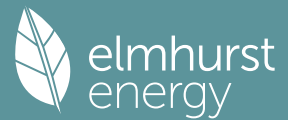
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m Jan 133.5331 Feb 133.5331 Mar 133.5331 Apr 133.5331 May 133.5331 Jun 133.5331 Jul 133.5331 Aug 133.5331 Sep 133.5331 Oct 133.5331 Nov 133.5331 Dec 133.5331 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
123.8795 137.1523 123.8795 128.0088 123.8795 128.0088 123.8795 128.0088 123.8795 128.0088 123.8795 128.0088 123.8795 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
245.3715 247.9177 241.5014 227.8418 210.5991 194.3933 183.5669 181.0207 187.4370 201.0966 218.3393 234.5451 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 36.3533 (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 3.0000 (70)													
Losses e.g. evaporation (negative values) (Table 5)													
-106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 -106.8265 (71)													
Water heating gains (Table 5)													
169.9651 167.0371 161.2447 148.3427 140.4847 132.2509 127.1032 131.2192 136.0617 145.1974 157.5543 168.2999 (72)													
Total internal gains	605.2761	618.1670	592.6855	570.2533	541.0232	517.7129	497.6095	499.1793	514.5674	536.2334	569.9623	592.7844	(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				7.0200	10.6334		0.5000		0.7000		0.7700		18.1055 (74)
South				13.2300	46.7521		0.5000		0.7000		0.7700		150.0244 (78)
Solar gains	168.1299	280.3018	371.7746	448.1746	495.8325	490.9320	473.7553	437.4787	397.6348	306.1993	200.1655	144.7285	(83)

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Total gains 773.4060 898.4689 964.4602 1018.4279 1036.8557 1008.6449 971.3647 936.6580 912.2022 842.4327 770.1279 737.5129 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.1786	61.2952	61.4099	61.9542	62.0572	62.5408	62.5408	62.6312	62.3537	62.0572	61.8493	61.6335
alpha	5.0786	5.0863	5.0940	5.1303	5.1371	5.1694	5.1694	5.1754	5.1569	5.1371	5.1233	5.1089
util living area	0.9892	0.9766	0.9539	0.8964	0.7824	0.6005	0.4402	0.4749	0.6942	0.9077	0.9769	0.9914 (86)
MIT	20.1096	20.2698	20.4573	20.6794	20.8415	20.9203	20.9367	20.9352	20.8987	20.6993	20.3673	20.0799 (87)
Th 2	20.0242	20.0259	20.0275	20.0353	20.0367	20.0434	20.0434	20.0447	20.0408	20.0367	20.0338	20.0307 (88)
util rest of house	0.9861	0.9700	0.9409	0.8679	0.7280	0.5194	0.3464	0.3792	0.6155	0.8762	0.9693	0.9888 (89)
MIT 2	18.9935	19.1963	19.4303	19.7019	19.8788	19.9553	19.9654	19.9661	19.9373	19.7315	19.3275	18.9610 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.1457	19.3426	19.5703	19.8352	20.0101	20.0869	20.0979	20.0982	20.0684	19.8634	19.4693	19.1136 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1457	19.3426	19.5703	19.8352	20.0101	20.0869	20.0979	20.0982	20.0684	19.8634	19.4693	19.1136 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9642	0.9335	0.8610	0.7264	0.5233	0.3518	0.3846	0.6179	0.8695	0.9635	0.9856 (94)
Useful gains	759.7384	866.3017	900.2833	876.9049	753.1328	527.7802	341.7626	360.2723	563.6302	732.5191	742.0261	726.9132 (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	1487.2298	1444.1025	1304.4469	1081.7673	820.7095	537.7013	342.7818	361.8952	586.6387	914.8669	1225.7069	1483.0091 (97)
Space heating kWh	541.2536	388.2822	300.6977	147.5009	50.2771	0.0000	0.0000	0.0000	0.0000	135.6668	348.2502	562.5353 (98a)
Space heating requirement - total per year (kWh/year)	2474.4638											
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	541.2536	388.2822	300.6977	147.5009	50.2771	0.0000	0.0000	0.0000	0.0000	135.6668	348.2502	562.5353 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2474.4638											
Space heating per m2	(98c) / (4) = 26.4649 (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 %)												88.8000 (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	541.2536	388.2822	300.6977	147.5009	50.2771	0.0000	0.0000	0.0000	0.0000	135.6668	348.2502	562.5353 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	609.5198	437.2547	338.6235	166.1046	56.6183	0.0000	0.0000	0.0000	0.0000	152.7779	392.1737	633.4857 (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	285.3139	252.2930	267.7954	234.7102	227.0487	204.0556	200.9233	209.1524	211.7359	236.7505	252.5468	282.0876 (64)
Efficiency of water heater	85.4726	85.0233	84.3203	83.0483	81.2937	79.8000	79.8000	79.8000	79.8000	82.8592	84.7807	79.8000 (216)
Fuel for water heating, kWh/month	333.8076	296.7339	317.5931	282.6191	279.2943	255.7088	251.7836	262.0958	265.3333	285.7261	297.8825	329.6317 (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	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)
Pumps and Fa	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-45.5879	-67.4728	-101.4513	-115.2021	-122.1492	-112.8616	-111.0653	-105.7148	-94.6076	-78.0303	-50.7679	-38.6682 (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)	-28.5275	-67.8664	-157.4537	-268.7724	-381.2358	-393.1793	-383.6392	-307.7456	-202.8233	-102.9524	-39.5057	-21.7259 (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	2786.5583 (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	3458.2096 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
central heating pump	41.0000 (230c)											
main heating flue fan	45.0000 (230e)											
Total electricity for the above, kWh/year	86.0000 (231)											

Full SAP Calculation Printout



Electricity for lighting (calculated in Appendix L)	183.6736 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3399.0063 (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	3115.4353 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2786.5583	0.2100	585.1772 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3458.2096	0.2100	726.2240 (264)
Space and water heating			1311.4013 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	183.6736	0.1443	26.5098 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1043.5790	0.1343	-140.1809
PV Unit electricity exported	-2355.4272	0.1229	-289.4086
Total			-429.5896 (269)
Total CO2, kg/year			920.2507 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.8400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2786.5583	1.1300	3148.8109 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3458.2096	1.1300	3907.7769 (278)
Space and water heating			7056.5878 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	183.6736	1.5338	281.7247 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1043.5790	1.4964	-1561.6616
PV Unit electricity exported	-2355.4272	0.4509	-1062.0018
Total			-2623.6634 (283)
Total Primary energy kWh/year			4844.7499 (286)
Dwelling Primary energy Rate (DPER)			51.8200 (287)

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

1. Overall dwelling characteristics

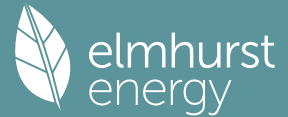
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	238.4250 (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) = 0.1258 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3758 (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) = 0.3195 (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												

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Effective ac	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3195	0.3434	0.3594	0.3754 (22b)
	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.2360	1.0000	2.2400		(26)
TER Opening Type (Uw = 1.20)			20.2500	1.1450	23.1870		(27)
Heat Loss Floor 1			46.7500	0.1300	6.0775		(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1800	13.7797		(29a)
Joist	46.7500		46.7500	0.1100	5.1425		(30)
Total net area of external elements Aum (A, m2)			192.5440				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4267		(33)
Party Wall			44.9800	0.0000	0.0000		(32)

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

235.9764 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E3 Sill	4.9000	0.0500	0.2450
E4 Jamb	54.7600	0.0500	2.7380
E5 Ground floor (normal)	19.4200	0.1600	3.1072
E6 Intermediate floor within a dwelling	19.4200	0.0000	0.0000
E16 Corner (normal)	10.2000	0.0900	0.9180
E18 Party wall between dwellings	10.2000	0.0600	0.6120
E25 Staggered party wall between dwellings	2.4000	0.0600	0.1440
P1 Party wall - Ground floor	8.8200	0.0800	0.7056
E10 Eaves (insulation at ceiling level)	10.6000	0.0600	0.6360
E12 Gable (insulation at ceiling level)	8.8200	0.0600	0.5292
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.1200	1.0584
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2254 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		61.6521 (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	45.8664	45.6130	45.3646	44.1978	43.9795	42.9633	42.9633	42.7752	43.3548	43.9795	44.4212	44.8828 (38)
Heat transfer coeff	107.5186	107.2651	107.0167	105.8500	105.6317	104.6155	104.6155	104.4273	105.0069	105.6317	106.0733	106.5350 (39)
Average = Sum(39)m / 12 =												105.8489

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1499	1.1472	1.1446	1.1321	1.1298	1.1189	1.1189	1.1169	1.1231	1.1298	1.1345	1.1394 (40)
HLP (average)												1.1321
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

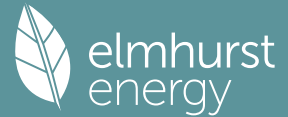
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6707 (42)
Hot water usage for mixer showers												68.7336 (42a)
Hot water usage for baths												29.6939 (42b)
Hot water usage for other uses												41.9802 (42c)
Average daily hot water use (litres/day)												129.4020 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	140.7728	137.7669	134.1062	128.5398	124.0195	119.1597	117.2921	120.9370	124.7810	129.8829	135.5351	140.4078 (44)
Energy content (annual)	222.9498	196.1782	206.1163	175.9645	166.9540	146.5208	141.8547	149.7452	153.8675	176.2499	193.0946	219.8446 (45)
Distribution loss (46)m = 0.15 x (45)m	33.4425	29.4267	30.9174	26.3947	25.0431	21.9781	21.2782	22.4618	23.0801	26.4375	28.9642	32.9767 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	269.5447	238.2639	252.7112	221.0564	213.5489	191.6126	188.4496	196.3401	198.9593	222.8448	238.1864	266.4395 (62)
WWHRS	-31.5430	-27.8969	-29.2120	-24.1887	-22.5430	-19.2902	-18.0815	-19.2279	-19.9584	-23.5287	-26.6552	-30.9589 (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	238.0017	210.3670	223.4992	196.8677	191.0059	172.3224	170.3681	177.1123	179.0009	199.3160	211.5312	235.4806 (64)
12Total per year (kWh/year)												2404.8731 (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	111.4067	98.8978	105.8096	94.5817	92.7881	84.7916	84.4426	87.0662	87.2344	95.8790	100.2774	110.3743 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8795	137.1523	123.8795	128.0088	123.8795	128.0088	123.8795	123.8795	128.0088	123.8795	128.0088	123.8795 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533 (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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265 (71)
Water heating gains (Table 5)	149.7402	147.1694	142.2172	131.3634	124.7152	117.7662	113.4981	117.0245	121.1589	128.8696	139.2742 (72)
Total internal gains	585.0511	598.2993	573.6580	553.2740	525.2537	503.2282	484.0044	484.9846	499.6646	519.9056	551.6822 (73)

6. Solar gains

[Jan]	Area		Solar flux		Specific data		Specific data		Access		Gains
	m2		Table 6a		or Table 6b		or Table 6c		factor		W
North	7.0200		10.6334		0.6300		0.7000		0.7700		22.8129 (74)
South	13.2300		46.7521		0.6300		0.7000		0.7700		189.0308 (78)
Solar gains	211.8437	353.1803	468.4360	564.7000	624.7490	618.5743	596.9316	551.2232	501.0198	385.8111	182.3579 (83)
Total gains	796.8948	951.4796	1042.0940	1117.9740	1150.0027	1121.8026	1080.9360	1036.2077	1000.6844	905.7167	755.1949 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.0025	57.1372	57.2698	57.9011	58.0208	58.5844	58.5844	58.6899	58.3660	58.0208	57.7792	57.5288
alpha	4.8002	4.8091	4.8180	4.8601	4.8681	4.9056	4.9056	4.9127	4.8911	4.8681	4.8519	4.8353
util living area	0.9886	0.9736	0.9465	0.8805	0.7584	0.5768	0.4221	0.4578	0.6756	0.8988	0.9753	0.9910 (86)
MIT	19.7910	20.0390	20.3210	20.6431	20.8672	20.9728	20.9951	20.9928	20.9416	20.6574	20.1693	19.7482 (87)
Th 2	19.9603	19.9625	19.9646	19.9747	19.9766	19.9854	19.9854	19.9871	19.9820	19.9766	19.9728	19.9688 (88)
util rest of house	0.9853	0.9662	0.9315	0.8484	0.7002	0.4936	0.3267	0.3599	0.5935	0.8644	0.9671	0.9884 (89)
MIT 2	18.5769	18.8899	19.2400	19.6291	19.8700	19.9704	19.9839	19.9846	19.9454	19.6559	19.0648	18.5288 (90)
Living area fraction	18.7425	19.0466	19.3874	19.7673	20.0060	20.1071	20.1218	20.1221	20.0812	19.7925	19.2154	0.1364 (91)
MIT	18.7425	19.0466	19.3874	19.7673	20.0060	20.1071	20.1218	20.1221	20.0812	19.7925	19.2154	18.6951 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7425	19.0466	19.3874	19.7673	20.0060	20.1071	20.1218	20.1221	20.0812	19.7925	19.2154	18.6951 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9798	0.9577	0.9212	0.8410	0.7020	0.5039	0.3397	0.3732	0.6020	0.8571	0.9589	0.9837 (94)
Useful gains	780.7810	911.2025	960.0077	940.1670	807.3433	565.2501	367.1948	386.7137	602.4572	776.3028	770.8646	742.8612 (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	1552.8340	1517.4404	1379.1684	1150.3076	877.3727	576.1249	368.4336	388.6846	628.0682	971.0154	1285.1246	1544.2309 (97)
Space heating kWh	574.4075	407.3919	311.8556	151.3012	52.1018	0.0000	0.0000	0.0000	0.0000	144.8662	370.2672	596.2190 (98a)
Space heating requirement - total per year (kWh/year)												2608.4104
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	574.4075	407.3919	311.8556	151.3012	52.1018	0.0000	0.0000	0.0000	0.0000	144.8662	370.2672	596.2190 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2608.4104
Space heating per m2										(98c) / (4) =		27.8974 (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	574.4075	407.3919	311.8556	151.3012	52.1018	0.0000	0.0000	0.0000	0.0000	144.8662	370.2672	596.2190 (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)	622.3266	441.3780	337.8717	163.9233	56.4484	0.0000	0.0000	0.0000	0.0000	156.9514	401.1563	645.9578 (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	238.0017	210.3670	223.4992	196.8677	191.0059	172.3224	170.3681	177.1123	179.0009	199.3160	211.5312	235.4806 (64)
Efficiency of water heater (217)m	85.9599	85.5157	84.8069	83.4766	81.5718	79.8000	79.8000	79.8000	79.8000	83.3559	85.3021	79.8000 (216)
Fuel for water heating, kWh/month	276.8754	245.9982	263.5388	235.8358	234.1567	215.9429	213.4938	221.9452	224.3119	239.1146	247.9788	273.6487 (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	25.7397	20.6493	18.5924	13.6216	10.5217	8.5963	9.5983	12.4762	16.2054	21.2623	24.0157	26.4551 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.0210	-60.2904	-86.1512	-96.2688	-103.2916	-96.1990	-94.9675	-89.8739	-80.8534	-68.6110	-47.1506	-37.2332 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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	-25.4302	-53.3610	-105.8225	-158.6136	-209.4352	-210.3562	-207.9205	-176.2169	-129.3620	-76.2521	-33.9305	-20.1234	(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												2826.0134	(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												2892.8408	(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)												207.7342	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2310.7359	(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												3701.8525	(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	2826.0134	0.2100	593.4628	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2892.8408	0.2100	607.4966	(264)
Space and water heating			1200.9594	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	207.7342	0.1443	29.9825	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-903.9116	0.1347	-121.7761	
PV Unit electricity exported	-1406.8242	0.1260	-177.1927	
Total			-298.9687	(269)
Total CO2, kg/year			943.9024	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2826.0134	1.1300	3193.3952	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2892.8408	1.1300	3268.9101	(278)
Space and water heating			6462.3053	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	207.7342	1.5338	318.6296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-903.9116	1.4979	-1353.9822	
PV Unit electricity exported	-1406.8242	0.4623	-650.4222	
Total			-2004.4044	(283)
Total Primary energy kWh/year			4906.6313	(286)
Target Primary Energy Rate (TPER)			52.4800	(287)

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

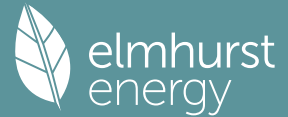
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)	
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (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)

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Number of flues attached to solid fuel boiler
Number of flues attached to other heater
Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
3 * 10 = 30.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
(5) = 0.1258 (8)
Yes
Blower Door
4.0000 (17)
0.3258 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.2770 (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	0.3531	0.3462	0.3393	0.3046	0.2977	0.2631	0.2631	0.2562	0.2770	0.2977	0.3116	0.3254	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5623	0.5599	0.5576	0.5464	0.5443	0.5346	0.5346	0.5328	0.5384	0.5443	0.5485	0.5529	(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	
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000	(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800	(29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500	(30)
Total net area of external elements Aum(A, m2)			192.5440					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Party Wall				0.0000	0.0000			(33)
GF			44.9800			45.0000	2024.1000	(32c)
FF			92.6800			75.0000	6951.0000	(32c)
Internal Floor 1			100.4900			9.0000	904.4100	(32c)
Internal Ceiling 1			46.7500			18.0000	841.5000	(32d)
			46.7500			9.0000	420.7500	(32e)

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

(28)...(30) + (32) = 50.7053
0.0000
0.0000

(32)...(30) + (32) + (32a)...(32e) = 22063.7900 (34)
235.9764 (35)

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.6400	0.0260	0.2766	
E3 Sill	4.9000	0.0230	0.1127	
E4 Jamb	54.7600	0.0180	0.9857	
E5 Ground floor (normal)	19.4200	0.0680	1.3206	
E6 Intermediate floor within a dwelling	19.4200	0.0010	0.0194	
E16 Corner (normal)	10.2000	0.0400	0.4080	
E18 Party wall between dwellings	10.2000	0.0320	0.3264	
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672	
P1 Party wall - Ground floor	8.8200	0.0580	0.5116	
E10 Eaves (insulation at ceiling level)	10.6000	0.0550	0.5830	
E12 Gable (insulation at ceiling level)	8.8200	0.0370	0.3263	
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.0330	0.2911	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.2286 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 55.9338 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.2454	44.0549	43.8682	42.9913	42.8272	42.0634	42.0634	41.9220	42.3576	42.8272	43.1591	43.5061	(38)
Heat transfer coeff	100.1793	99.9888	99.8021	98.9251	98.7610	97.9972	97.9972	97.8558	98.2914	98.7610	99.0930	99.4400	(39)
Average = Sum(39)m / 12 =												98.9243	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0714	1.0694	1.0674	1.0580	1.0563	1.0481	1.0481	1.0466	1.0512	1.0563	1.0598	1.0635	(40)
HLP (average)												1.0580	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Hot water usage for mixer showers
Hot water usage for baths
Hot water usage for other uses
Average daily hot water use (litres/day)

2.6707 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.7749	69.8058	67.6561	64.9807	62.5938	60.1133	59.5980	61.7434	63.9436	66.4909	69.1901	71.6741	(44)
Energy conte	113.6738	99.4025	103.9850	88.9553	84.2633	73.9163	72.0787	76.4512	78.8489	90.2276	98.5739	112.2244	(45)
Energy content (annual)										Total = Sum(45)m =		1092.6008	
Distribution loss (46)m = 0.15 x (45)m	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)
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	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	96.6228	84.4922	88.3872	75.6120	71.6238	62.8289	61.2669	64.9835	67.0216	76.6934	83.7878	95.3907	(62)

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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	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	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	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	0.0000 (63d)
Output from w/h	96.6228	84.4922	88.3872	75.6120	71.6238	62.8289	61.2669	64.9835	67.0216	76.6934	83.7878	95.3907	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =												928.7107 (64)
Electric shower(s)	55.2559	49.2334	53.7610	51.3035	52.2662	49.8569	51.5188	52.2662	51.3035	53.7610	52.7501	55.2559	(64a)
Heat gains from water heating, kWh/month	37.9697	33.4314	35.5371	31.7289	30.9725	28.1714	28.1964	29.3124	29.5813	32.6136	34.1345	37.6616	(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	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	133.5331	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8795	137.1523	123.8795	128.0088	123.8795	128.0088	123.8795	123.8795	128.0088	123.8795	128.0088	123.8795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	(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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)	51.0345	49.7491	47.7649	44.0679	41.6297	39.1270	37.8984	39.3984	41.0851	43.8355	47.4090	50.6205	(72)
Total internal gains	483.3454	497.8790	476.2057	462.9784	439.1682	424.5890	408.4047	407.3585	419.5908	431.8715	456.8171	472.1050	(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				7.0200	10.6334	0.5000	0.7000		0.7700		18.1055 (74)	
South				13.2300	46.7521	0.5000	0.7000		0.7700		150.0244 (78)	
Solar gains	168.1299	280.3018	371.7746	448.1746	495.8325	490.9320	473.7553	437.4787	397.6348	306.1993	200.1655	144.7285 (83)
Total gains	651.4753	778.1809	847.9803	911.1531	935.0007	915.5211	882.1599	844.8372	817.2256	738.0708	656.9826	616.8335 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.1786	61.2952	61.4099	61.9542	62.0572	62.5408	62.5408	62.6312	62.3537	62.0572	61.8493	61.6335	
alpha	5.0786	5.0863	5.0940	5.1303	5.1371	5.1694	5.1694	5.1754	5.1569	5.1371	5.1233	5.1089	
util living area	0.9949	0.9870	0.9717	0.9275	0.8295	0.6512	0.4825	0.5230	0.7508	0.9407	0.9881	0.9961 (86)	
MIT	19.7518	19.9744	20.2405	20.5703	20.8255	20.9621	20.9933	20.9899	20.9210	20.5934	20.1111	19.7117 (87)	
Th 2	20.0242	20.0259	20.0275	20.0353	20.0367	20.0434	20.0434	20.0447	20.0408	20.0367	20.0338	20.0307 (88)	
util rest of house	0.9933	0.9832	0.9630	0.9050	0.7796	0.5672	0.3809	0.4193	0.6733	0.9175	0.9838	0.9949 (89)	
MIT 2	18.8939	19.1153	19.3773	19.6971	19.9214	20.0261	20.0417	20.0418	19.9996	19.7255	19.2583	18.8591 (90)	
Living area fraction	fLA = Living area / (4) =												0.1364 (91)
MIT	19.0109	19.2325	19.4950	19.8162	20.0447	20.1538	20.1714	20.1711	20.1253	19.8438	19.3746	18.9754 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.0109	19.2325	19.4950	19.8162	20.0447	20.1538	20.1714	20.1711	20.1253	19.8438	19.3746	18.9754 (93)	

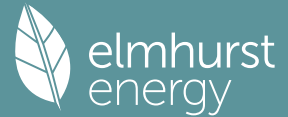
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9911	0.9790	0.9570	0.8990	0.7801	0.5774	0.3947	0.4334	0.6807	0.9118	0.9799	0.9931	(94)
Ext temp.	645.6798	761.8571	811.5419	819.1278	729.3489	528.6174	348.2095	366.1453	556.3016	673.0008	643.8050	612.5658	(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	1473.7233	1433.0885	1296.9312	1079.8839	824.1268	544.2540	349.9900	369.0202	592.2330	912.9317	1216.3264	1469.2617	(97)
Space heating requirement - total per year (kWh/year)	616.0643	451.0675	361.1296	187.7444	70.5148	0.0000	0.0000	0.0000	0.0000	178.5086	412.2154	637.3817	(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)
Space heating kWh	616.0643	451.0675	361.1296	187.7444	70.5148	0.0000	0.0000	0.0000	0.0000	178.5086	412.2154	637.3817	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2914.6263												
Space heating per m2	(98c) / (4) =												31.1725 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	921.1741	725.1796	743.7041	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9361	0.9197	0.9197	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	808.5859	678.8078	683.9556	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1021.0298	984.4385	943.2487	0.0000	0.0000	0.0000	0.0000	(103)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	152.9596	227.3892	192.9141	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.2399	56.8473	48.2285	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												143.3157 (107)
Energy for space heating												31.1725 (99)
Energy for space cooling												1.5328 (108)
Total												32.7053 (109)
Fabric Energy Efficiency (DFEE)												32.7 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	238.4250 (5)

2. Ventilation rate

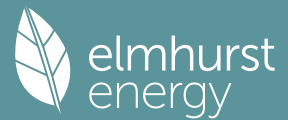
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1258 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3758 (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) = 0.3195 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3195	0.3434	0.3594	0.3754 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704 (25)

3. Heat losses and heat loss parameter

Element	Gross 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
TER Opaque door			2.2360	1.0000	2.2400		(26)
TER Opening Type (Uw = 1.20)			20.2500	1.1450	23.1870		(27)
Heat Loss Floor 1			46.7500	0.1300	6.0775		(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1800	13.7797		(29a)
Joist	46.7500		46.7500	0.1100	5.1425		(30)
Total net area of external elements Aum(A, m ²)			192.5440				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4267		(33)
Party Wall			44.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.9764 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.6400	0.0500	0.5320	
E3 Sill				4.9000	0.0500	0.2450	
E4 Jamb				54.7600	0.0500	2.7380	
E5 Ground floor (normal)				19.4200	0.1600	3.1072	
E6 Intermediate floor within a dwelling				19.4200	0.0000	0.0000	
E16 Corner (normal)				10.2000	0.0900	0.9180	
E18 Party wall between dwellings				10.2000	0.0600	0.6120	
E25 Staggered party wall between dwellings				2.4000	0.0600	0.1440	
P1 Party wall - Ground floor				8.8200	0.0800	0.7056	
E10 Eaves (insulation at ceiling level)				10.6000	0.0600	0.6360	
E12 Gable (insulation at ceiling level)				8.8200	0.0600	0.5292	
P4 Party wall - Roof (insulation at ceiling level)				8.8200	0.1200	1.0584	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2254 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	61.6521 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 45.8664	Feb 45.6130	Mar 45.3646	Apr 44.1978	May 43.9795	Jun 42.9633	Jul 42.9633	Aug 42.7752	Sep 43.3548	Oct 43.9795	Nov 44.4212	Dec 44.8828 (38)
Heat transfer coeff	107.5186	107.2651	107.0167	105.8500	105.6317	104.6155	104.6155	104.4273	105.0069	105.6317	106.0733	106.5350 (39)
Average = Sum(39)m / 12 =												105.8489
HLP	Jan 1.1499	Feb 1.1472	Mar 1.1446	Apr 1.1321	May 1.1298	Jun 1.1189	Jul 1.1189	Aug 1.1169	Sep 1.1231	Oct 1.1298	Nov 1.1345	Dec 1.1394 (40)
HLP (average)												1.1321
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

-----Water heating energy requirements (kWh/year)-----													
Assumed occupancy												2.6707 (42)	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)	
Hot water usage for baths	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939 (42b)	
Hot water usage for other uses	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802 (42c)	
Average daily hot water use (litres/day)												65.7882 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.7749	69.8058	67.6561	64.9807	62.5938	60.1133	59.5980	61.7434	63.9436	66.4909	69.1901	71.6741 (44)	
Energy content (annual)	113.6738	99.4025	103.9850	88.9553	84.2633	73.9163	72.0787	76.4512	78.8489	90.2276	98.5739	112.2244 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1092.6008	
	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)	
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	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													
	96.6228	84.4922	88.3872	75.6120	71.6238	62.8289	61.2669	64.9835	67.0216	76.6934	83.7878	95.3907 (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	96.6228	84.4922	88.3872	75.6120	71.6238	62.8289	61.2669	64.9835	67.0216	76.6934	83.7878	95.3907 (64)	
										Total per year (kWh/year) = Sum(64)m =			928.7107 (64)
12Total per year (kWh/year)												929 (64)	
Electric shower(s)	55.2559	49.2334	53.7610	51.3035	52.2662	49.8569	51.5188	52.2662	51.3035	53.7610	52.7501	55.2559 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												628.5324 (64a)	
Heat gains from water heating, kWh/month													
	37.9697	33.4314	35.5371	31.7289	30.9725	28.1714	28.1964	29.3124	29.5813	32.6136	34.1345	37.6616 (65)	

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan 133.5331	Feb 133.5331	Mar 133.5331	Apr 133.5331	May 133.5331	Jun 133.5331	Jul 133.5331	Aug 133.5331	Sep 133.5331	Oct 133.5331	Nov 133.5331	Dec 133.5331 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8795	137.1523	123.8795	128.0088	123.8795	128.0088	123.8795	123.8795	128.0088	123.8795	128.0088	123.8795 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.3715	247.9177	241.5014	227.8418	210.5991	194.3933	183.5669	181.0207	187.4370	201.0966	218.3393	234.5451 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533	36.3533 (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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265 (71)
Water heating gains (Table 5)	51.0345	49.7491	47.7649	44.0679	41.6297	39.1270	37.8984	39.3984	41.0851	43.8355	47.4090	50.6205 (72)
Total internal gains	483.3454	497.8790	476.2057	462.9784	439.1682	424.5890	408.4047	407.3585	419.5908	431.8715	456.8171	472.1050 (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	7.0200	10.6334	0.6300	0.7000	0.7700	22.8129 (74)						
South	13.2300	46.7521	0.6300	0.7000	0.7700	189.0308 (78)						
Solar gains	211.8437	353.1803	468.4360	564.7000	624.7490	618.5743	596.9316	551.2232	501.0198	385.8111	252.2086	182.3579 (83)
Total gains	695.1891	851.0593	944.6417	1027.6785	1063.9172	1043.1634	1005.3363	958.5817	920.6106	817.6826	709.0256	654.4629 (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 57.0025	Feb 57.1372	Mar 57.2698	Apr 57.9011	May 58.0208	Jun 58.5844	Jul 58.5844	Aug 58.6899	Sep 58.3660	Oct 58.0208	Nov 57.7792	Dec 57.5288
tau	4.8002	4.8091	4.8180	4.8601	4.8681	4.9056	4.9056	4.9127	4.8911	4.8681	4.8519	4.8353
util living area	0.9935	0.9828	0.9621	0.9065	0.7949	0.6137	0.4524	0.4926	0.7183	0.9262	0.9849	0.9951 (86)
MIT	19.6745	19.9311	20.2279	20.5796	20.8354	20.9645	20.9934	20.9901	20.9237	20.5891	20.0662	19.6313 (87)
Th 2	19.9603	19.9625	19.9646	19.9747	19.9766	19.9854	19.9854	19.9871	19.9820	19.9766	19.9728	19.9688 (88)
util rest of house												

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MIT 2	0.9915	0.9778	0.9507	0.8790	0.7394	0.5277	0.3509	0.3884	0.6363	0.8984	0.9796	0.9936 (89)
Living area fraction	18.7672	19.0220	19.3127	19.6510	19.8711	19.9698	19.9838	19.9843	19.9436	19.6685	19.1655	18.7310 (90)
MIT	18.8909	19.1459	19.4375	19.7776	20.0026	20.1054	20.1215	20.1215	20.0772	19.7940	19.2883	18.8538 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8909	19.1459	19.4375	19.7776	20.0026	20.1054	20.1215	20.1215	20.0772	19.7940	19.2883	18.8538 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9887	0.9725	0.9435	0.8728	0.7409	0.5383	0.3648	0.4025	0.6446	0.8924	0.9748	0.9913	(94)
Useful gains	687.3357	827.6858	891.3011	896.9939	788.3086	561.5244	366.6991	385.8741	593.3881	729.6827	691.1321	648.7476	(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	1568.7951	1528.0919	1384.5290	1151.3950	877.0169	575.9550	368.3990	388.6257	627.6504	971.1787	1292.8539	1561.1389	(97)
Space heating kWh	655.8058	470.6729	366.9616	183.1688	65.9989	0.0000	0.0000	0.0000	0.0000	179.6730	433.2397	678.8192	(98a)
Space heating requirement - total per year (kWh/year)												3034.3398	
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	655.8058	470.6729	366.9616	183.1688	65.9989	0.0000	0.0000	0.0000	0.0000	179.6730	433.2397	678.8192	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3034.3398	
Space heating per m2												(98c) / (4) =	32.4528 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	983.3855	774.1546	793.6474	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8941	0.9446	0.9296	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	879.2070	731.2423	737.7399	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1170.2221	1128.4109	1076.1968	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	209.5309	295.4934	251.8119	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.3827	73.8733	62.9530	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												189.2091 (107)
Energy for space heating												32.4528 (99)
Energy for space cooling												2.0236 (108)
Total												34.4765 (109)
Fabric Energy Efficiency (TFEE)												34.5 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

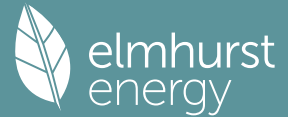
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (5)

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) = 0.1258 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3258 (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) = 0.2770 (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)

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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	0.3531	0.3462	0.3393	0.3046	0.2977	0.2631	0.2631	0.2562	0.2770	0.2977	0.3116	0.3254 (22b)
	0.5623	0.5599	0.5576	0.5464	0.5443	0.5346	0.5346	0.5328	0.5384	0.5443	0.5485	0.5529 (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	
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000	(28a)
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800	(29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500	(30)
Total net area of external elements Aum(A, m2)			192.5440					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.7053			(33)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000	(32)
GF			92.6800			75.0000	6951.0000	(32c)
FF			100.4900			9.0000	904.4100	(32c)
Internal Floor 1			46.7500			18.0000	841.5000	(32d)
Internal Ceiling 1			46.7500			9.0000	420.7500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22063.7900	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							235.9764	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				10.6400	0.0260		0.2766	
E3 Sill				4.9000	0.0230		0.1127	
E4 Jamb				54.7600	0.0180		0.9857	
E5 Ground floor (normal)				19.4200	0.0680		1.3206	
E6 Intermediate floor within a dwelling				19.4200	0.0010		0.0194	
E16 Corner (normal)				10.2000	0.0400		0.4080	
E18 Party wall between dwellings				10.2000	0.0320		0.3264	
E25 Staggered party wall between dwellings				2.4000	0.0280		0.0672	
P1 Party wall - Ground floor				8.8200	0.0580		0.5116	
E10 Eaves (insulation at ceiling level)				10.6000	0.0550		0.5830	
E12 Gable (insulation at ceiling level)				8.8200	0.0370		0.3263	
P4 Party wall - Roof (insulation at ceiling level)				8.8200	0.0330		0.2911	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2286	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	55.9338	(37)

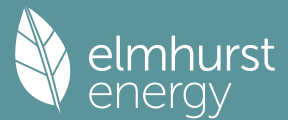
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6707 (42)
Hot water usage for mixer showers													
Hot water usage for baths	94.8722	93.4465	91.3689	87.3938	84.4603	81.1888	79.3294	81.3912	83.6514	87.1639	91.2244	94.5087	(42a)
Hot water usage for other uses	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939	(42b)
Average daily hot water use (litres/day)	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802	(42c)
												153.2572	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	166.6471	163.2523	159.0250	152.3745	147.0541	141.3022	138.9274	143.1346	147.5950	153.6549	160.4145	166.1829	(44)
Energy content (annual)	263.9282	232.4691	244.4155	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303	(46)
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746	(62)
WWHRS	-26.9868	-23.8673	-24.9925	-20.6948	-19.2868	-16.5038	-15.4697	-16.4505	-17.0755	-20.1301	-22.8050	-26.4870	(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	285.3139	252.2930	267.7954	234.7102	227.0487	204.0556	200.9233	209.1524	211.7359	236.7505	252.5468	282.0876	(64)
												2864.4134	(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	126.4541	112.2489	119.9661	106.8068	104.5206	95.2206	94.5648	97.6271	97.9644	108.0269	113.4391	125.2152	(65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0009	23.0938	18.7811	14.2185	10.6285	8.9730	9.6957	12.6028	16.9155	21.4781	25.0681	26.7235	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.2262	370.0265	360.4499	340.0625	314.3270	290.1393	273.9804	270.1801	279.7567	300.1442	325.8796	350.0673	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)	169.9651	167.0371	161.2447	148.3427	140.4847	132.2509	127.1032	131.2192	136.0617	145.1974	157.5543	168.2999	(72)
Total internal gains	672.3001	670.2652	650.5836	612.7316	575.5481	538.4711	517.8872	521.1100	539.8417	576.9275	618.6098	655.1987	(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				7.0200	10.6334	0.5000	0.7000		18.1055 (74)			
South				13.2300	46.7521	0.5000	0.7000	0.7700	150.0244 (78)			
Solar gains	168.1299	280.3018	371.7746	448.1746	495.8325	490.9320	473.7553	437.4787	397.6348	306.1993	200.1655	144.7285 (83)
Total gains	840.4300	950.5670	1022.3582	1060.9062	1071.3806	1029.4031	991.6424	958.5887	937.4765	883.1268	818.7754	799.9272 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.1786	61.2952	61.4099	61.9542	62.0572	62.5408	62.5408	62.6312	62.3537	62.0572	61.8493	61.6335	
alpha	5.0786	5.0863	5.0940	5.1303	5.1371	5.1694	5.1694	5.1754	5.1569	5.1371	5.1233	5.1089	
util living area	0.9847	0.9707	0.9432	0.8829	0.7665	0.5900	0.4315	0.4646	0.6798	0.8932	0.9705	0.9878	(86)
MIT	20.1667	20.3112	20.4977	20.7012	20.8506	20.9218	20.9370	20.9357	20.9024	20.7214	20.4060	20.1339	(87)
Th 2	20.0242	20.0259	20.0275	20.0353	20.0367	20.0434	20.0434	20.0447	20.0408	20.0367	20.0338	20.0307	(88)
util rest of house	0.9804	0.9628	0.9279	0.8522	0.7111	0.5097	0.3394	0.3707	0.6013	0.8587	0.9611	0.9843	(89)
MIT 2	19.0653	19.2474	19.4786	19.7257	19.8870	19.9562	19.9655	19.9663	19.9399	19.7552	19.3750	19.0292	(90)
Living area fraction	19.2155	19.3925	19.6175	19.8587	20.0184	20.0879	20.0980	20.0985	20.0711	19.8870	19.5156	19.1798	(92)
MIT	19.2155	19.3925	19.6175	19.8587	20.0184	20.0879	20.0980	20.0985	20.0711	19.8870	19.5156	19.1798	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.2155	19.3925	19.6175	19.8587	20.0184	20.0879	20.0980	20.0985	20.0711	19.8870	19.5156	19.1798	(93)

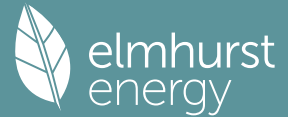
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9564	0.9201	0.8458	0.7099	0.5136	0.3447	0.3760	0.6039	0.8525	0.9547	0.9802	(94)
Useful gains	820.0285	909.0795	940.7093	897.2997	760.6237	528.6780	341.8680	360.4561	566.1375	752.8434	781.7100	784.1156	(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	1494.2255	1449.0883	1309.1574	1084.0939	821.5354	537.7990	342.7942	361.9164	586.9122	917.1901	1230.3005	1489.5938	(97)
Space heating kWh	501.6026	362.8859	274.1253	134.4919	45.3183	0.0000	0.0000	0.0000	0.0000	122.2739	322.9852	524.8758	(98a)
Space heating requirement - total per year (kWh/year)												2288.5589	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	501.6026	362.8859	274.1253	134.4919	45.3183	0.0000	0.0000	0.0000	0.0000	122.2739	322.9852	524.8758	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2288.5589	
Space heating per m ²										(98c) / (4) =		24.4766	(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 %)												88.8000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	501.6026	362.8859	274.1253	134.4919	45.3183	0.0000	0.0000	0.0000	0.0000	122.2739	322.9852	524.8758	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	564.8678	408.6553	308.6997	151.4548	51.0341	0.0000	0.0000	0.0000	0.0000	137.6958	363.7221	591.0763	(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	285.3139	252.2930	267.7954	234.7102	227.0487	204.0556	200.9233	209.1524	211.7359	236.7505	252.5468	282.0876	(64)
Efficiency of water heater	85.3115	84.8743	84.1122	82.8592	81.1688	79.8000	79.8000	79.8000	79.8000	82.6530	84.6126	85.4319	(216)
Fuel for water heating, kWh/month	334.4378	297.2549	318.3787	283.2641	279.7241	255.7088	251.7836	262.0958	265.3333	286.4391	298.4744	330.1901	(219)
Space cooling fuel requirement													

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(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	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.5879	-67.4728	-101.4513	-115.2021	-122.1492	-112.8616	-111.0653	-105.7148	-94.6076	-78.0303	-50.7679	-38.6682	(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	-28.5275	-67.8664	-157.4537	-268.7724	-381.2358	-393.1793	-383.6392	-307.7456	-202.8233	-102.9524	-39.5057	-21.7259	(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												2577.2059	(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												3463.0847	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												183.6736	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3399.0063	(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												2910.9580	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2577.2059	3.6400	93.8103	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3463.0847	3.6400	126.0563	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	183.6736	16.4900	30.2878	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1043.5790	16.4900	-172.0862	
PV Unit electricity exported	-2355.4272	5.5900	-131.6684	
Total			-303.7546	(252)
Total energy cost			52.5812	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.1367	(257)
SAP value		97.7845	
SAP rating (Section 12)		98	(258)
SAP band		A	

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	2577.2059	0.2100	541.2132	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3463.0847	0.2100	727.2478	(264)
Space and water heating			1268.4610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	183.6736	0.1443	26.5098	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1043.5790	0.1343	-140.1809	
PV Unit electricity exported	-2355.4272	0.1229	-289.4086	
Total			-429.5896	(269)
Total CO2, kg/year			877.3105	(272)
CO2 emissions per m2			9.3800	(273)
EI value			91.5119	
EI rating			92	(274)
EI band			A	

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (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) =	0.1258 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											4.0000 (17)	
Infiltration rate											0.3258 (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) =	0.2770 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2908	0.2770	0.2770	0.2562	0.2562	0.2285	0.2354	0.2216	0.2285	0.2423	0.2423	0.2631 (22b)
Effective ac	0.5423	0.5384	0.5384	0.5328	0.5328	0.5261	0.5277	0.5245	0.5261	0.5294	0.5294	0.5346 (25)

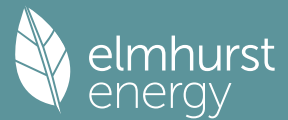
3. Heat losses and heat loss parameter

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						
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870			(27)					
Door 1.2			2.2360	1.2000	2.6880			(26)					
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000	(28a)					
Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800	(29a)					
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500	(30)					
Total net area of external elements Aum(A, m2)			192.5440					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.7053			(33)					
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000	(32)					
GF			92.6800			75.0000	6951.0000	(32c)					
FF			100.4900			9.0000	904.4100	(32c)					
Internal Floor 1			46.7500			18.0000	841.5000	(32d)					
Internal Ceiling 1			46.7500			9.0000	420.7500	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	22063.7900	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							235.9764	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				10.6400	0.0260	0.2766							
E3 Sill				4.9000	0.0230	0.1127							
E4 Jamb				54.7600	0.0180	0.9857							
E5 Ground floor (normal)				19.4200	0.0680	1.3206							
E6 Intermediate floor within a dwelling				19.4200	0.0010	0.0194							
E16 Corner (normal)				10.2000	0.0400	0.4080							
E18 Party wall between dwellings				10.2000	0.0320	0.3264							
E25 Staggered party wall between dwellings				2.4000	0.0280	0.0672							
P1 Party wall - Ground floor				8.8200	0.0580	0.5116							
E10 Eaves (insulation at ceiling level)				10.6000	0.0550	0.5830							
E12 Gable (insulation at ceiling level)				8.8200	0.0370	0.3263							
P4 Party wall - Roof (insulation at ceiling level)				8.8200	0.0330	0.2911							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2286	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	55.9338	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 42.6669	Feb 42.3576	Mar 42.3576	Apr 41.9220	May 41.9220	Jun 41.3939	Jul 41.5203	Aug 41.2713	Sep 41.3939	Oct 41.6504	Nov 41.6504	Dec 42.0634	(38)
Heat transfer coeff	98.6007	98.2914	98.2914	97.8558	97.8558	97.3277	97.4541	97.2052	97.3277	97.5842	97.5842	97.9972	(39)
Average = Sum(39)m / 12 =												97.7813	
HLP	Jan 1.0546	Feb 1.0512	Mar 1.0512	Apr 1.0466	May 1.0466	Jun 1.0409	Jul 1.0423	Aug 1.0396	Sep 1.0409	Oct 1.0437	Nov 1.0437	Dec 1.0481	(40)
HLP (average)												1.0458	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6707 (42)											
Hot water usage for mixer showers												
	94.8722	93.4465	91.3689	87.3938	84.4603	81.1888	79.3294	81.3912	83.6514	87.1639	91.2244	94.5087 (42a)
Hot water usage for baths												

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Hot water usage for other uses	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939 (42b)
Average daily hot water use (litres/day)	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802 (42c)
												153.2572 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	166.6471	163.2523	159.0250	152.3745	147.0541	141.3022	138.9274	143.1346	147.5950	153.6549	160.4145	166.1829 (44)
Energy content (annual)	263.9282	232.4691	244.4155	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022 (45)
Distribution loss (46)m = 0.15 x (45)m	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303 (46)
Water storage loss:												150.0000 (47)
Store volume												1.5000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8100 (55)
Enter (49) or (54) in (55)												
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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	312.3006	276.1603	292.7879	255.4050	246.3355	220.5595	216.3931	225.6029	228.8115	256.8806	275.3518	308.5746 (62)
WWHRS	-26.9868	-23.8673	-24.9925	-20.6948	-19.2868	-16.5038	-15.4697	-16.4505	-17.0755	-20.1301	-22.8050	-26.4870 (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	285.3139	252.2930	267.7954	234.7102	227.0487	204.0556	200.9233	209.1524	211.7359	236.7505	252.5468	282.0876 (64)
												2864.4134 (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	126.4541	112.2489	119.9661	106.8068	104.5206	95.2206	94.5648	97.6271	97.9644	108.0269	113.4391	125.2152 (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	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0009	23.0938	18.7811	14.2185	10.6285	8.9730	9.6957	12.6028	16.9155	21.4781	25.0681	26.7235 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.2262	370.0265	360.4499	340.0625	314.3270	290.1393	273.9804	270.1801	279.7567	300.1442	325.8796	350.0673 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946 (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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265 (71)
Water heating gains (Table 5)	169.9651	167.0371	161.2447	148.3427	140.4847	132.2509	127.1032	131.2192	136.0617	145.1974	157.5543	168.2999 (72)
Total internal gains	672.3001	670.2652	650.5836	612.7316	575.5481	538.4711	517.8872	521.1100	539.8417	576.9275	618.6098	655.1987 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North				7.0200	11.9814		0.5000		0.7000	0.7700	20.4008 (74)	
South				13.2300	50.9848		0.5000		0.7000	0.7700	163.6071 (78)	
Solar gains	184.0079	275.8595	362.1068	452.8560	491.6865	522.7854	498.2960	467.6455	420.7022	321.8258	224.3586	156.9299 (83)
Total gains	856.3079	946.1247	1012.6904	1065.5875	1067.2346	1061.2564	1016.1832	988.7555	960.5439	898.7534	842.9684	812.1286 (84)

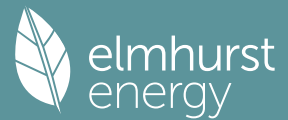
7. Mean internal temperature (heating season)

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	62.1581	62.3537	62.3537	62.6312	62.6312	62.9711	62.8894	63.0505	62.9711	62.8055	62.8055	62.5408
alpha	5.1439	5.1569	5.1569	5.1754	5.1754	5.1981	5.1926	5.2034	5.1981	5.1870	5.1870	5.1694
util living area	0.9793	0.9648	0.9293	0.8460	0.6874	0.4542	0.2969	0.3141	0.5718	0.8468	0.9562	0.9832 (86)
MIT	20.2715	20.3889	20.5771	20.7706	20.8949	20.9361	20.9400	20.9400	20.9264	20.7968	20.5155	20.2430 (87)
Th 2	20.0381	20.0408	20.0408	20.0447	20.0447	20.0494	20.0482	20.0504	20.0494	20.0471	20.0471	20.0434 (88)
util rest of house	0.9733	0.9551	0.9100	0.8070	0.6204	0.3700	0.2060	0.2212	0.4851	0.8001	0.9422	0.9783 (89)
MIT 2	19.2089	19.3569	19.5861	19.8115	19.9358	19.9712	19.9716	19.9739	19.9657	19.8464	19.5210	19.1777 (90)
Living area fraction	19.3538	19.4976	19.7213	19.9422	20.0666	20.1027	20.1037	20.1057	20.0967	19.9760	19.6566	19.3230 (91)
MIT	19.3538	19.4976	19.7213	19.9422	20.0666	20.1027	20.1037	20.1057	20.0967	19.9760	19.6566	19.3230 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3538	19.4976	19.7213	19.9422	20.0666	20.1027	20.1037	20.1057	20.0967	19.9760	19.6566	19.3230 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9679	0.9484	0.9025	0.8023	0.6220	0.3748	0.2113	0.2266	0.4895	0.7961	0.9351	0.9735 (94)
Ext temp.	828.8397	897.2751	913.9200	854.9482	663.8421	397.7593	214.7020	224.0459	470.2195	715.5165	788.2773	790.5876 (95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
	1405.4320	1366.0154	1211.0739	982.6915	691.5035	399.3106	214.7549	224.1226	476.5866	817.3658	1137.5039	1393.8136 (97)

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Space heating kWh	428.9847	314.9935	221.0825	91.9752	20.5801	0.0000	0.0000	0.0000	0.0000	75.7759	251.4431	448.8001 (98a)
Space heating requirement - total per year (kWh/year)												1853.6351
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	428.9847	314.9935	221.0825	91.9752	20.5801	0.0000	0.0000	0.0000	0.0000	75.7759	251.4431	448.8001 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1853.6351
Space heating per m2										(98c) / (4) =		19.8250 (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 %)												88.8000 (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	428.9847	314.9935	221.0825	91.9752	20.5801	0.0000	0.0000	0.0000	0.0000	75.7759	251.4431	448.8001 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	483.0909	354.7224	248.9668	103.5756	23.1758	0.0000	0.0000	0.0000	0.0000	85.3332	283.1567	505.4055 (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	285.3139	252.2930	267.7954	234.7102	227.0487	204.0556	200.9233	209.1524	211.7359	236.7505	252.5468	282.0876 (64)
Efficiency of water heater	84.9721	84.5587	83.6332	82.1439	80.4779	79.8000	79.8000	79.8000	79.8000	81.8104	84.0500	79.8000 (216)
Fuel for water heating, kWh/month	335.7735	298.3643	320.2023	285.7304	282.1256	255.7088	251.7836	262.0958	265.3333	289.3892	300.4723	331.4937 (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	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-50.4389	-68.8148	-102.3369	-117.1048	-122.6243	-114.8553	-112.8192	-108.6319	-98.3148	-82.3269	-56.7434	-42.5855 (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)	-34.4848	-70.7437	-160.9385	-283.8780	-387.9492	-433.6617	-417.9334	-346.1347	-229.1092	-116.8552	-49.2421	-25.9319 (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												2087.4270 (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												3478.4728 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												183.6736 (232)

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

PV generation			-3634.4586 (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			2201.1147 (238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2087.4270	5.6000	116.8959 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3478.4728	5.6000	194.7945 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	183.6736	26.0600	47.8653 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1077.5964	26.0600	-280.8216
PV Unit electricity exported	-2556.8622	5.8100	-148.5537
Total			-429.3753 (252)
Total energy cost			51.5920 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2087.4270	0.2100	438.3597 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3478.4728	0.2100	730.4793 (264)
Space and water heating			1168.8389 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	183.6736	0.1443	26.5098 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1077.5964	0.1346	-144.9947
PV Unit electricity exported	-2556.8622	0.1225	-313.2104
Total			-458.2051 (269)
Total CO2, kg/year			749.0729 (272)

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	2087.4270	1.1300	2358.7925 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3478.4728	1.1300	3930.6743 (278)
Space and water heating			6289.4667 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	183.6736	1.5338	281.7247 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1077.5964	1.4973	-1613.4712
PV Unit electricity exported	-2556.8622	0.4494	-1149.1153
Total			-2762.5865 (283)
Total Primary energy kWh/year			3938.7057 (286)

SAP 10 EPC IMPROVEMENTS

Be lean Act

Current energy efficiency rating: A 98
Current environmental impact rating: A 92

N Solar water heating			Recommended
U Solar photovoltaic panels			Already installed
V2 Wind turbine			Not applicable
Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.0	-£ 43	-216 kg (28.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£43	2.31 kg/m²	A 99
Total Savings	£43	2.31 kg/m²	A 93
Potential energy efficiency rating:			A 99
Potential environmental impact rating:			A 93

Fuel prices for cost data on this page from database revision number 560 TEST (06 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):	Current	Potential	Saving
Electricity	£70	£91	-£21
Mains gas	£411	£350	£61
Space heating	£238	£261	-£23
Water heating	£195	£132	£63
Lighting	£48	£48	£0
Generated (PV)	-£429	-£433	£3
Total cost of fuels	£52	£8	£43
Total cost of uses	£52	£8	£43
Delivered energy	24 kWh/m²	13 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m²	8 kg/m²	6 kg/m²	2 kg/m²
Primary energy	42 kWh/m²	30 kWh/m²	12 kWh/m²

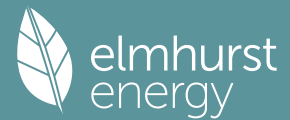
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 238.4250 (5)

elmhurst
energy

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	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303 (46)
Water storage loss:												190.0000 (47)
Store volume												1.5000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8100 (55)
Enter (49) or (54) in (55)												
Total storage loss												25.1100 (56)
If cylinder contains dedicated solar storage												15.1982 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	-26.9868	-23.8673	-24.9925	-20.6948	-19.2868	-16.5038	-15.4697	-16.4505	-17.0755	-20.1301	-22.8050	-26.4870 (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)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
If combined cylinder, total volume of cylinder												190.0000 (H13)
Effective solar volume												109.5000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.1973 (H16)
Heat delivered to hot water												658.0749 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												658.0749
Solar input	-0.0000	-19.7410	-62.3439	-84.2788	-108.8308	-100.2887	-99.5804	-87.6515	-61.7500	-32.8405	-0.7692	-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	275.4020	223.5993	194.1440	134.0857	95.5117	81.5682	78.4041	99.4926	134.9910	192.6024	242.1855	272.1757 (64)
												Total per year (kWh/year) = Sum(64)m = 2024.1621 (64)
Electric shower(s)												0.0000 (64a)
	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												
	118.5246	105.0868	110.9200	93.7302	86.3557	77.4616	76.2138	80.0204	85.9684	98.9808	105.7654	117.2857 (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	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0009	23.0938	18.7811	14.2185	10.6285	8.9730	9.6957	12.6028	16.9155	21.4781	25.0681	26.7235	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.2262	370.0265	360.4499	340.0625	314.3270	290.1393	273.9804	270.1801	279.7567	300.1442	325.8796	350.0673	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	(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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)	159.3072	156.3792	149.0860	130.1808	116.0695	107.5855	102.4378	107.5543	119.4006	133.0388	146.8964	157.6420	(72)
Total internal gains	661.6422	659.6073	638.4249	594.5697	551.1329	513.8057	493.2218	497.4452	523.1807	564.7688	607.9520	644.5408	(73)

6. Solar gains

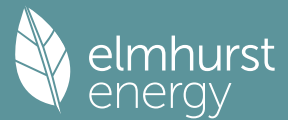
[Jan]				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Specific data		Specific data		factor		W
					W/m2	or Table 6b		or Table 6c		Table 6d		
North				7.0200	10.6334	0.5000		0.7000		0.7700		18.1055 (74)
South				13.2300	46.7521	0.5000		0.7000		0.7700		150.0244 (78)
Solar gains	168.1299	280.3018	371.7746	448.1746	495.8325	490.9320	473.7553	437.4787	397.6348	306.1993	200.1655	144.7285 (83)
Total gains	829.7721	939.9091	1010.1995	1042.7443	1046.9654	1004.7377	966.9771	934.9239	920.8154	870.9681	808.1175	789.2693 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.1786	61.2952	61.4099	61.9542	62.0572	62.5408	62.5408	62.6312	62.3537	62.0572	61.8493	61.6335	
alpha	5.0786	5.0863	5.0940	5.1303	5.1371	5.1694	5.1694	5.1754	5.1569	5.1371	5.1233	5.1089	
util living area	0.9855	0.9720	0.9455	0.8887	0.7778	0.6025	0.4421	0.4757	0.6892	0.8976	0.9720	0.9884	(86)
MIT	20.1577	20.3029	20.4894	20.6921	20.8442	20.9200	20.9367	20.9352	20.9000	20.7149	20.3977	20.1247	(87)
Th 2	20.0242	20.0259	20.0275	20.0353	20.0367	20.0434	20.0434	20.0447	20.0408	20.0367	20.0338	20.0307	(88)
util rest of house	0.9814	0.9644	0.9307	0.8589	0.7230	0.5213	0.3480	0.3799	0.6106	0.8640	0.9630	0.9851	(89)
MIT 2	19.0540	19.2371	19.4687	19.7158	19.8813	19.9551	19.9654	19.9661	19.9382	19.7484	19.3648	19.0177	(90)
Living area fraction	19.2046	19.3825	19.6079	19.8489	20.0126	20.0867	20.0978	20.0982	20.0693	19.8802	19.5056	19.1686	(91)
MIT	19.2046	19.3825	19.6079	19.8489	20.0126	20.0867	20.0978	20.0982	20.0693	19.8802	19.5056	19.1686	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2046	19.3825	19.6079	19.8489	20.0126	20.0867	20.0978	20.0982	20.0693	19.8802	19.5056	19.1686	(93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9769	0.9580	0.9230	0.8523	0.7215	0.5251	0.3534	0.3853	0.6131	0.8576	0.9567	0.9812	(94)
Useful gains	810.5738	900.4609	932.4381	888.7810	755.4101	527.6013	341.7382	360.2568	564.5166	746.9608	773.1614	774.4577	(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	1493.1270	1448.0833	1308.1940	1083.1233	820.9609	537.6819	342.7789	361.8934	586.7354	916.5187	1229.3104	1488.4806	(97)
Space heating kWh	507.8195	368.0022	279.5624	139.9265	48.7698	0.0000	0.0000	0.0000	0.0000	126.1511	328.4273	531.2331	(98a)
Space heating requirement - total per year (kWh/year)												2329.8919	
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	507.8195	368.0022	279.5624	139.9265	48.7698	0.0000	0.0000	0.0000	0.0000	126.1511	328.4273	531.2331	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2329.8919	
Space heating per m2										(98c) / (4) =		24.9186	(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 %)												88.8000	(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	507.8195	368.0022	279.5624	139.9265	48.7698	0.0000	0.0000	0.0000	0.0000	126.1511	328.4273	531.2331	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	571.8688	414.4169	314.8225	157.5748	54.9210	0.0000	0.0000	0.0000	0.0000	142.0620	369.8506	598.2354	(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	275.4020	223.5993	194.1440	134.0857	95.5117	81.5682	78.4041	99.4926	134.9910	192.6024	242.1855	272.1757	(64)
Efficiency of water heater (217)m	85.4128	85.1695	84.8768	84.1555	82.6308	79.8000	79.8000	79.8000	79.8000	83.1346	84.7435	85.5320	(216)
Fuel for water heating, kWh/month	322.4366	262.5345	228.7363	159.3308	115.5884	102.2157	98.2508	124.6774	169.1616	231.6753	285.7866	318.2151	(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	14.0986	12.7342	14.0986	13.6438	14.0986	13.6438	14.0986	14.0986	13.6438	14.0986	13.6438	14.0986	(231)
Lighting	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.8246	-67.9748	-102.5040	-116.8407	-124.3637	-115.1983	-113.4631	-107.7990	-96.1038	-78.8709	-51.1131	-38.8591	(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	-28.2908	-67.3644	-156.4010	-267.1338	-379.0213	-390.8426	-381.2414	-305.6615	-201.3270	-102.1118	-39.1605	-21.5350	(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												2623.7521	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2418.6090	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												166.0000	(231)
Electricity for lighting (calculated in Appendix L)												183.6736	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3399.0063	(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												1993.0284	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2623.7521	3.6400	95.5046 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2418.6090	3.6400	88.0374 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	183.6736	16.4900	30.2878 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1058.9152	16.4900	-174.6151

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PV Unit electricity exported	-2340.0910	5.5900	-130.8111
Total			-305.4262 (252)
Total energy cost			27.7769 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.0722 (257)
SAP value		98.8296
SAP rating (Section 12)		99 (258)
SAP band		A

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	2623.7521	0.2100	550.9879 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2418.6090	0.2100	507.9079 (264)
Space and water heating			1058.8958 (265)
Pumps, fans and electric keep-hot	166.0000	0.1387	23.0262 (267)
Energy for lighting	183.6736	0.1443	26.5098 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1058.9152	0.1342	-142.1476
PV Unit electricity exported	-2340.0910	0.1229	-287.5076
Total			-429.6552 (269)
Total CO2, kg/year			678.7766 (272)
CO2 emissions per m2			7.2600 (273)
EI value			93.4328
EI rating			93 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.7500 (1b)	x 2.4000 (2b)	= 112.2000 (1b) - (3b)
First floor	46.7500 (1c)	x 2.7000 (2c)	= 126.2250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	238.4250 (5)

2. Ventilation rate

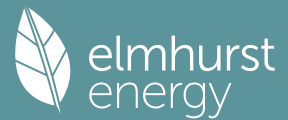
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1258 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3258 (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) = 0.2770 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2908	0.2770	0.2770	0.2562	0.2562	0.2285	0.2354	0.2216	0.2285	0.2423	0.2423	0.2631 (22b)
Effective ac	0.5423	0.5384	0.5384	0.5328	0.5328	0.5261	0.5277	0.5245	0.5261	0.5294	0.5294	0.5346 (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
Window 1.2 (Uw = 1.20)			20.2500	1.1450	23.1870		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			46.7500	0.1100	5.1425	110.0000	5142.5000 (28a)

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Cavity Wall	99.0400	22.4860	76.5540	0.1900	14.5453	70.0000	5358.7800 (29a)
Joist	46.7500		46.7500	0.1100	5.1425	9.0000	420.7500 (30)
Total net area of external elements Aum(A, m2)			192.5440				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.7053		(33)
Party Wall			44.9800	0.0000	0.0000	45.0000	2024.1000 (32)
GF			92.6800			75.0000	6951.0000 (32c)
FF			100.4900			9.0000	904.4100 (32c)
Internal Floor 1			46.7500			18.0000	841.5000 (32d)
Internal Ceiling 1			46.7500			9.0000	420.7500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22063.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 235.9764 (35)

List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
E2 Other lintels (including other steel lintels)	10.6400	0.0260	0.2766				
E3 Sill	4.9000	0.0230	0.1127				
E4 Jamb	54.7600	0.0180	0.9857				
E5 Ground floor (normal)	19.4200	0.0680	1.3206				
E6 Intermediate floor within a dwelling	19.4200	0.0010	0.0194				
E16 Corner (normal)	10.2000	0.0400	0.4080				
E18 Party wall between dwellings	10.2000	0.0320	0.3264				
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672				
P1 Party wall - Ground floor	8.8200	0.0580	0.5116				
E10 Eaves (insulation at ceiling level)	10.6000	0.0550	0.5830				
E12 Gable (insulation at ceiling level)	8.8200	0.0370	0.3263				
P4 Party wall - Roof (insulation at ceiling level)	8.8200	0.0330	0.2911				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2286 (36)
Point Thermal Bridges							0.0000 (36a) =
Total fabric heat loss							(33) + (36) + (36a) = 55.9338 (37)

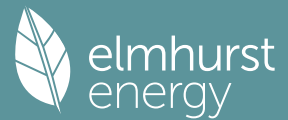
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	42.6669	42.3576	42.3576	41.9220	41.9220	41.3939	41.5203	41.2713	41.3939	41.6504	41.6504	42.0634	(38)
Average = Sum(39)m / 12 =	98.6007	98.2914	98.2914	97.8558	97.8558	97.3277	97.4541	97.2052	97.3277	97.5842	97.5842	97.9972	(39)
												97.7813	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0546	1.0512	1.0512	1.0466	1.0466	1.0409	1.0423	1.0396	1.0409	1.0437	1.0437	1.0481	(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													2.6707 (42)
Hot water usage for mixer showers													
	94.8722	93.4465	91.3689	87.3938	84.4603	81.1888	79.3294	81.3912	83.6514	87.1639	91.2244	94.5087	(42a)
Hot water usage for baths													
	29.7946	29.3521	28.7290	27.5801	26.7198	25.7658	25.2506	25.8693	26.5431	27.5638	28.7364	29.6939	(42b)
Hot water usage for other uses													
	41.9802	40.4537	38.9271	37.4006	35.8740	34.3475	34.3475	35.8740	37.4006	38.9271	40.4537	41.9802	(42c)
Average daily hot water use (litres/day)													153.2572 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	166.6471	163.2523	159.0250	152.3745	147.0541	141.3022	138.9274	143.1346	147.5950	153.6549	160.4145	166.1829	(44)
Energy conte	263.9282	232.4691	244.4155	208.5930	197.9631	173.7475	168.0207	177.2305	181.9995	208.5082	228.5398	260.2022	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	39.5892	34.8704	36.6623	31.2890	29.6945	26.0621	25.2031	26.5846	27.2999	31.2762	34.2810	39.0303	(46)
Water storage loss:													
Store volume													190.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8100 (55)
Total storage loss													
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage													
	15.1982	13.7274	15.1982	14.7079	15.1982	14.7079	15.1982	15.1982	14.7079	15.1982	14.7079	15.1982	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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													
	302.3888	267.2077	281.4804	239.0593	223.6293	198.3607	193.4543	203.5946	213.8165	245.5730	265.7597	298.6628	(62)
WWHRS	-26.9868	-23.8673	-24.9925	-20.6948	-19.2868	-16.5038	-15.4697	-16.4505	-17.0755	-20.1301	-22.8050	-26.4870	(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)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
If combined cylinder, total volume of cylinder													190.0000 (H13)
Effective solar volume													109.5000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.1973 (H16)
Heat delivered to hot water													719.5008 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													719.5008
Solar input	-1.9826	-21.0519	-63.2900	-88.5925	-110.7637	-109.7599	-107.6787	-98.0951	-70.3834	-39.6901	-8.2127	-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													
	273.4194	222.2885	193.1978	129.7720	93.5788	72.0969	70.3059	89.0490	126.3575	185.7527	234.7420	272.1757	(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													
	118.5246	105.0868	110.9200	93.7302	86.3557	77.4616	76.2138	80.0204	85.9684	98.9808	105.7654	117.2857	(65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	160.2397	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0009	23.0938	18.7811	14.2185	10.6285	8.9730	9.6957	12.6028	16.9155	21.4781	25.0681	26.7235	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	366.2262	370.0265	360.4499	340.0625	314.3270	290.1393	273.9804	270.1801	279.7567	300.1442	325.8796	350.0673	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	53.6946	(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)	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	-106.8265	(71)
Water heating gains (Table 5)	159.3072	156.3792	149.0860	130.1808	116.0695	107.5855	102.4378	107.5543	119.4006	133.0388	146.8964	157.6420	(72)
Total internal gains	661.6422	659.6073	638.4249	594.5697	551.1329	513.8057	493.2218	497.4452	523.1807	564.7688	607.9520	644.5408	(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					7.0200	11.9814		0.5000	0.7000	0.7700	20.4008 (74)	
South					13.2300	50.9848		0.5000	0.7000	0.7700	163.6071 (78)	
Solar gains	184.0079	275.8595	362.1068	452.8560	491.6865	522.7854	498.2960	467.6455	420.7022	321.8258	224.3586	156.9299 (83)
Total gains	845.6501	935.4668	1000.5317	1047.4256	1042.8194	1036.5911	991.5178	965.0906	943.8828	886.5947	832.3105	801.4707 (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	62.1581	62.3537	62.3537	62.6312	62.6312	62.9711	62.8894	63.0505	62.9711	62.8055	62.8055	62.5408		
alpha	5.1439	5.1569	5.1569	5.1754	5.1754	5.1981	5.1926	5.2034	5.1981	5.1870	5.1870	5.1694		
util living area	0.9803	0.9663	0.9321	0.8529	0.6996	0.4645	0.3042	0.3217	0.5807	0.8523	0.9583	0.9841	(86)	
MIT	20.2627	20.3808	20.5693	20.7631	20.8912	20.9357	20.9399	20.9399	20.9254	20.7918	20.5077	20.2340	(87)	
Th 2	20.0381	20.0408	20.0408	20.0447	20.0447	20.0494	20.0482	20.0504	20.0494	20.0471	20.0471	20.0434	(88)	
util rest of house	0.9746	0.9570	0.9135	0.8148	0.6325	0.3787	0.2111	0.2266	0.4931	0.8064	0.9448	0.9794	(89)	
MIT 2	19.1980	19.3469	19.5771	19.8038	19.9328	19.9710	19.9716	19.9739	19.9652	19.8415	19.5117	19.1665	(90)	
Living area fraction									fLA = Living area / (4) =			0.1364	(91)	
MIT	19.3432	19.4879	19.7124	19.9346	20.0635	20.1025	20.1036	20.1056	20.0961	19.9711	19.6475	19.3121	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.3432	19.4879	19.7124	19.9346	20.0635	20.1025	20.1036	20.1056	20.0961	19.9711	19.6475	19.3121	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9694	0.9503	0.9059	0.8099	0.6339	0.3835	0.2165	0.2321	0.4976	0.8022	0.9378	0.9748	(94)
Ext temp.	819.7427	888.9972	906.3610	848.2623	661.0885	397.5602	214.6940	224.0346	469.6684	711.2219	780.5150	781.2481	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Space heating kWh	1404.3856	1365.0626	1210.2066	981.9450	691.2059	399.2882	214.7537	224.1210	476.5264	816.8872	1136.6152	1392.7465	(97)
Space heating requirement - total per year (kWh/year)	434.9743	319.9159	226.0611	96.2515	22.4074	0.0000	0.0000	0.0000	0.0000	78.6150	256.3922	454.9549	(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)	434.9743	319.9159	226.0611	96.2515	22.4074	0.0000	0.0000	0.0000	0.0000	78.6150	256.3922	454.9549	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1889.5723	
Space heating per m2										(98c) / (4) =		20.2093	(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 %)												88.8000 (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	434.9743	319.9159	226.0611	96.2515	22.4074	0.0000	0.0000	0.0000	0.0000	78.6150	256.3922	454.9549	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	489.8359	360.2657	254.5733	108.3914	25.2335	0.0000	0.0000	0.0000	0.0000	88.5304	288.7299	512.3365	(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	273.4194	222.2885	193.1978	129.7720	93.5788	72.0969	70.3059	89.0490	126.3575	185.7527	234.7420	272.1757	(64)
Efficiency of water heater (217)m	85.0957	84.8756	84.4130	83.3995	81.3937	79.8000	79.8000	79.8000	79.8000	82.2798	84.2581	79.8000	(216)
Fuel for water heating, kWh/month	321.3081	261.8992	228.8721	155.6028	114.9705	90.3470	88.1026	111.5902	158.3428	225.7574	278.5989	319.4436	(219)

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Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.0986	12.7342	14.0986	13.6438	14.0986	13.6438	14.0986	14.0986	13.6438	14.0986	13.6438	14.0986	14.0986	(231)
Lighting	22.7584	18.2577	16.4390	12.0439	9.3031	7.6007	8.4866	11.0312	14.3284	18.7996	21.2341	23.3910	23.3910	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-50.7197	-69.3349	-103.4079	-118.8081	-124.8636	-117.3344	-115.3450	-110.8814	-99.9486	-83.2585	-57.1623	-42.8097	-42.8097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-34.2040	-70.2235	-159.8674	-282.1747	-385.7098	-431.1826	-415.4076	-343.8851	-227.4754	-115.9236	-48.8231	-25.7076	-25.7076	(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													2127.8967	(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													2354.8350	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													80.0000	(230g)
Total electricity for the above, kWh/year													166.0000	(231)
Electricity for lighting (calculated in Appendix L)													183.6736	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3634.4586	(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													1197.9467	(238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2127.8967	5.6000	119.1622	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2354.8350	5.6000	131.8708	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Pump for solar water heating	80.0000	26.0600	20.8480	(249)
Energy for lighting	183.6736	26.0600	47.8653	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1093.8741	26.0600	-285.0636	
PV Unit electricity exported	-2540.5845	5.8100	-147.6080	
Total			-432.6716	(252)
Total energy cost			8.4864	(255)

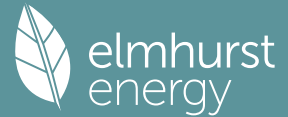
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2127.8967	0.2100	446.8583	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2354.8350	0.2100	494.5154	(264)
Space and water heating			941.3737	(265)
Pumps, fans and electric keep-hot	166.0000	0.1387	23.0262	(267)
Energy for lighting	183.6736	0.1443	26.5098	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1093.8741	0.1345	-147.0824	
PV Unit electricity exported	-2540.5845	0.1225	-311.1920	
Total			-458.2743	(269)
Total CO2, kg/year			532.6353	(272)

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	2127.8967	1.1300	2404.5233	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2354.8350	1.1300	2660.9636	(278)
Space and water heating			5065.4869	(279)
Pumps, fans and electric keep-hot	166.0000	1.5128	251.1248	(281)
Energy for lighting	183.6736	1.5338	281.7247	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1093.8741	1.4969	-1637.4584	
PV Unit electricity exported	-2540.5845	0.4494	-1141.7096	
Total			-2779.1680	(283)
Total Primary energy kWh/year			2819.1684	(286)

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Property Reference	Ground Floor Apartment				Issued on Date	29/01/2025
Assessment Reference	Be Green Act		Prop Type Ref			
Property						
SAP Rating	81 B	DER	4.86	TER	11.18	
Environmental	96 A	% DER < TER				56.53
CO ₂ Emissions (t/year)	0.32	DFEE	25.79	TFEE	28.64	
Compliance Check	See BREL	% DFEE < TFEE				9.96
% DPER < TPER	12.40	DPER	51.43	TPER	58.71	
Assessor Details	Mr. James Rivers				Assessor ID	R423-0001
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)
Ground floor	72.9118 (1b)	2.4000 (2b)	174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.9883 (5)

2. Ventilation rate

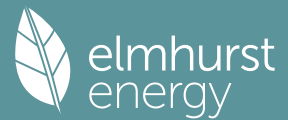
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1143 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3143 (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) = 0.2671 (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	0.3406	0.3339	0.3273	0.2939	0.2872	0.2538	0.2538	0.2471	0.2671	0.2872	0.3005	0.3139 (22b)
Effective ac	0.5580	0.5558	0.5535	0.5432	0.5412	0.5322	0.5322	0.5305	0.5357	0.5412	0.5452	0.5493 (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
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980 (28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619 (29a)
Total net area of external elements Aum(A, m ²)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9307		(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590 (32)
Party Ceiling 1			72.9100			30.0000	2187.3000 (32b)
Internal Wall 1			120.8600			75.0000	9064.5000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23471.7189 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							321.9194 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.5114	0.0260	0.1693	
E3 Sill				1.4000	0.0230	0.0322	
E4 Jamb				22.5353	0.0180	0.4056	
E5 Ground floor (normal)				23.0370	0.0680	1.5665	
E7 Party floor between dwellings (in blocks of flats)				23.0370	0.0360	0.8293	
E16 Corner (normal)				4.8000	0.0400	0.1920	

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E18 Party wall between dwellings	2.4000	0.0320	0.0768
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672
P1 Party wall - Ground floor	11.3830	0.0580	0.6602
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.9992 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	34.9299 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 32.2229	Feb 32.0928	Mar 31.9653	Apr 31.3664	May 31.2544	Jun 30.7328	Jul 30.7328	Aug 30.6362	Sep 30.9337	Oct 31.2544	Nov 31.4811	Dec 31.7180 (38)
Heat transfer coeff	67.1528	67.0228	66.8953	66.2964	66.1843	65.6627	65.6627	65.5661	65.8636	66.1843	66.4110	66.6480 (39)
Average = Sum(39)m / 12 =												66.2958
HLP	Jan 0.9210	Feb 0.9192	Mar 0.9175	Apr 0.9093	May 0.9077	Jun 0.9006	Jul 0.9006	Aug 0.8993	Sep 0.9033	Oct 0.9077	Nov 0.9108	Dec 0.9141 (40)
HLP (average)												0.9093
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

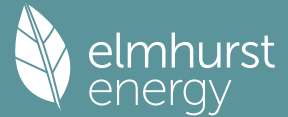
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.3147 (42)
Hot water usage for mixer showers												
86.6655	85.3630	83.4652	79.8339	77.1542	74.1657	72.4671	74.3506	76.4153	79.6240	83.3332	86.3334	(42a)
Hot water usage for baths												
27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	(42b)
Hot water usage for other uses												
38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	(42c)
Average daily hot water use (litres/day)												139.9970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040	(44)
Energy conte	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												2325.3646
36.1638	31.8533	33.4903	28.5818	27.1253	23.8072	23.0225	24.2844	24.9378	28.5701	31.3149	35.6533	(46)
Water storage loss:												150.0000 (47)
Store volume												1.5000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8100 (55)
Enter (49) or (54) in (55)												
Total storage loss												
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage												
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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												
289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609	(62)
WWHRS	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	(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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (64)
12Total per year (kWh/year)												2894.9106 (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	118.8611	105.5611	112.9347	100.8059	98.8257	90.2223	89.7311	92.5284	92.7284	102.0283	106.8642	117.7293 (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
115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
109.4444	121.1705	109.4444	113.0925	109.4444	113.0925	109.4444	113.0925	109.4444	113.0925	109.4444	113.0925	109.4444 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.9954	206.1122	200.7779	189.4217	175.0865	161.6135	152.6126	150.4958	155.8302	167.1864	181.5215	194.9946	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	(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)												
-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	(71)
Water heating gains (Table 5)												
159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383	(72)
Total internal gains	530.9196	542.0881	519.7366	500.2428	475.0814	457.7351	440.3837	442.0266	455.4325	471.4859	500.7569	520.3976 (73)

6. Solar gains												
[Jan]			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
East			1.8900		19.6403		0.5000		0.7000		0.7700	9.0035 (76)
South			8.7306		46.7521		0.5000		0.7000		0.7700	99.0025 (78)
Solar gains	108.0060	179.7533	235.5439	275.7361	295.0956	287.1682	279.2529	265.5266	249.4884	195.7828	128.5780	92.9513 (83)
Total gains	638.9256	721.8414	755.2805	775.9789	770.1770	744.9032	719.6366	707.5532	704.9209	667.2686	629.3349	613.3489 (84)

7. Mean internal temperature (heating season)												
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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	97.0908	97.2792	97.4646	98.3451	98.5116	99.2941	99.2941	99.4404	98.9912	98.5116	98.1753	97.8263
alpha	7.4727	7.4853	7.4976	7.5563	7.5674	7.6196	7.6196	7.6294	7.5994	7.5674	7.5450	7.5218
util living area	0.9935	0.9831	0.9615	0.8973	0.7647	0.5610	0.4012	0.4259	0.6364	0.8965	0.9816	0.9951 (86)
Living	20.5058	20.6148	20.7317	20.8601	20.9341	20.9570	20.9590	20.9590	20.9536	20.8749	20.6744	20.4844
Non living	19.5818	19.7196	19.8639	20.0171	20.0906	20.1136	20.1146	20.1157	20.1093	20.0365	19.8014	19.5598
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	20.7472	20.6148	20.7317	20.8601	20.9341	20.9570	20.9590	20.9590	20.9536	20.8749	20.6744	20.5566 (87)
Th 2	20.1497	20.1512	20.1527	20.1596	20.1609	20.1670	20.1670	20.1681	20.1647	20.1609	20.1583	20.1555 (88)
util rest of house	0.9911	0.9771	0.9480	0.8653	0.7081	0.4896	0.3254	0.3491	0.5633	0.8585	0.9739	0.9932 (89)
MIT 2	19.9233	19.7196	19.8639	20.0171	20.0906	20.1136	20.1146	20.1157	20.1093	20.0365	19.8014	19.6672 (90)
Living area fraction												
MIT	20.2507	20.0754	20.2088	20.3522	20.4259	20.4488	20.4502	20.4509	20.4449	20.3698	20.1484	20.0207 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2507	20.0754	20.2088	20.3522	20.4259	20.4488	20.4502	20.4509	20.4449	20.3698	20.1484	20.0207 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9914	0.9764	0.9490	0.8733	0.7266	0.5140	0.3512	0.3752	0.5882	0.8689	0.9738	0.9928 (94)
Useful gains	633.4308	704.8237	716.7885	677.6396	559.6463	382.8508	252.7584	265.5075	414.6611	579.8014	612.8414	608.9473 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1071.1377	1017.0978	917.0530	759.2382	577.5183	384.0497	252.8151	265.6015	417.8979	646.6053	866.5570	1054.4166 (97)
Space heating kWh	325.6539	209.8482	148.9968	58.7510	13.2968	0.0000	0.0000	0.0000	0.0000	49.7021	182.6752	331.4292 (98a)
Space heating requirement - total per year (kWh/year)												1320.3531
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	325.6539	209.8482	148.9968	58.7510	13.2968	0.0000	0.0000	0.0000	0.0000	49.7021	182.6752	331.4292 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1320.3531
Space heating per m2										(98c) / (4) =		18.1089 (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 %)												220.9462 (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	325.6539	209.8482	148.9968	58.7510	13.2968	0.0000	0.0000	0.0000	0.0000	49.7021	182.6752	331.4292 (98)
Space heating efficiency (main heating system 1)	220.9462	220.9462	220.9462	220.9462	220.9462	0.0000	0.0000	0.0000	0.0000	220.9462	220.9462	220.9462 (210)
Space heating fuel (main heating system)	147.3906	94.9770	67.4358	26.5906	6.0181	0.0000	0.0000	0.0000	0.0000	22.4951	82.6786	150.0044 (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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (64)
Efficiency of water heater (217)m	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602 (216)
Fuel for water heating, kWh/month	167.4558	148.1235	157.1448	137.3117	132.5971	118.8977	116.7739	121.6407	123.2580	138.1692	147.8522	165.4868 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (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												597.5902 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												172.8602
Water heating fuel used												1674.7116 (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)												166.8530 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

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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	2439.1548 (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	597.5902	0.1575	94.1300 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1674.7116	0.1410	236.1585 (264)
Space and water heating			330.2886 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	166.8530	0.1443	24.0820 (268)
Total CO2, kg/year			354.3706 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8600 (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	597.5902	1.5831	946.0429 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1674.7116	1.5214	2547.9501 (278)
Space and water heating			3493.9930 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	166.8530	1.5338	255.9247 (282)
Total Primary energy kWh/year			3749.9177 (286)
Dwelling Primary energy Rate (DPER)			51.4300 (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)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (5)

2. Ventilation rate

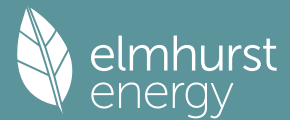
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1714 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4214 (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) = 0.3582 (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	0.4567	0.4478	0.4388	0.3940	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5741	0.5579	0.5579	0.5549	0.5642	0.5741	0.5812	0.5886 (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
TER Opaque door			2.2360	1.0000	2.2400		(26)
TER Opening Type (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Heat Loss Floor 1			72.9118	0.1300	9.4785		(28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1800	7.6378		(29a)

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Total net area of external elements Aum(A, m2)	128.2041		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	31.5167	(33)
Party Wall	27.3191	0.0000	0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 331.9191 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	6.5114	0.0500	0.3256
E2 Other lintels (including other steel lintels)	1.4000	0.0500	0.0700
E3 Sill	22.5353	0.0500	1.1268
E4 Jamb	23.0370	0.1600	3.6859
E5 Ground floor (normal)	23.0370	0.0700	1.6126
E7 Party floor between dwellings (in blocks of flats)	4.8000	0.0900	0.4320
E16 Corner (normal)	2.4000	0.0600	0.1440
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E25 Staggered party wall between dwellings	11.3830	0.0800	0.9106
P1 Party wall - Ground floor			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.4515 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 39.9681 (37)

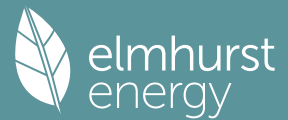
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	34.8962	34.6623	34.4331	33.3563	33.1548	32.2169	32.2169	32.0433	32.5782	33.1548	33.5624	33.9885	(38)
Average = Sum(39)m / 12 =	74.8644	74.6305	74.4012	73.3244	73.1229	72.1851	72.1851	72.0114	72.5463	73.1229	73.5305	73.9566	(39)
	73.3234												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0268	1.0236	1.0204	1.0057	1.0029	0.9900	0.9900	0.9877	0.9950	1.0029	1.0085	1.0143	(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													2.3147 (42)
Hot water usage for mixer showers													
Hot water usage for baths	63.0294	62.0822	60.7019	58.0610	56.1121	53.9387	52.7033	54.0732	55.5748	57.9083	60.6060	62.7879	(42a)
Hot water usage for other uses	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	(42b)
Average daily hot water use (litres/day)	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	(42c)
	118.2054												(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	128.5921	125.8465	122.5028	117.4180	113.2889	108.8497	107.1435	110.4728	113.9840	118.6444	123.8076	128.2586	(44)
Energy content (annual)	203.6585	179.2038	188.2823	160.7394	152.5086	133.8435	129.5808	136.7884	140.5537	160.9993	176.3866	200.8219	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	30.5488	26.8806	28.2423	24.1109	22.8763	20.0765	19.4371	20.5183	21.0831	24.1499	26.4580	30.1233	(46)
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	250.2534	221.2895	234.8772	205.8312	199.1035	178.9353	176.1757	183.3833	185.6455	207.5942	221.4785	247.4168	(62)
PV diverter	-28.8144	-25.4837	-26.6851	-22.0963	-20.5930	-17.6215	-16.5174	-17.5646	-18.2319	-21.4934	-24.3494	-28.2808	(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)
12Total per year (kWh/year)	221.4390	195.8058	208.1921	183.7349	178.5106	161.3138	159.6583	165.8187	167.4136	186.1008	197.1290	219.1360	(64)
Electric shower(s)													
Heat gains from water heating, kWh/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	(64a)
	104.9924	93.2538	99.8798	89.5193	87.9850	80.5764	80.3615	82.7581	82.8076	90.8082	94.7226	104.0492	(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	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4444	121.1705	109.4444	113.0925	109.4444	113.0925	109.4444	109.4444	113.0925	109.4444	113.0925	109.4444	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	203.9954	206.1122	200.7779	189.4217	175.0865	161.6135	152.6126	150.4958	155.8302	167.1864	181.5215	194.9946	(68)
Pumps, fans	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	(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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	(71)
Total internal gains	141.1188	138.7706	134.2470	124.3324	118.2595	111.9117	108.0128	111.2339	115.0105	122.0540	131.5584	139.8511	(72)
	515.2789	526.7737	505.1896	487.5669	463.5107	444.3380	427.7902	428.8945	441.6535	459.4051	486.8928	505.0104	(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								

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East	1.8900	19.6403	0.6300	0.7000	0.7700	11.3444 (76)
South	8.7306	46.7521	0.6300	0.7000	0.7700	124.7431 (78)

Solar gains	136.0875	226.4891	296.7853	347.4275	371.8205	361.8319	351.8587	334.5635	314.3554	246.6863	162.0082	117.1186 (83)
Total gains	651.3664	753.2628	801.9750	834.9944	835.3312	806.1699	779.6488	763.4580	756.0089	706.0914	648.9010	622.1290 (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	89.7951	90.0765	90.3540	91.6809	91.9335	93.1280	93.1280	93.3526	92.6642	91.9335	91.4240	90.8972
alpha	6.9863	7.0051	7.0236	7.1121	7.1289	7.2085	7.2085	7.2235	7.1776	7.1289	7.0949	7.0598
util living area	0.9949	0.9855	0.9648	0.9016	0.7711	0.5686	0.4070	0.4333	0.6501	0.9070	0.9851	0.9962 (86)
MIT	20.2841	20.4538	20.6369	20.8397	20.9571	20.9957	20.9997	20.9995	20.9892	20.8567	20.5436	20.2583 (87)
Th 2	20.0611	20.0637	20.0663	20.0786	20.0809	20.0916	20.0916	20.0936	20.0875	20.0809	20.0763	20.0714 (88)
util rest of house	0.9929	0.9799	0.9515	0.8685	0.7103	0.4902	0.3232	0.3483	0.5699	0.8688	0.9783	0.9947 (89)
MIT 2	19.2476	19.4631	19.6903	19.9340	20.0510	20.0898	20.0916	20.0935	20.0821	19.9587	19.5878	19.2231 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6596	19.8568	20.0665	20.2940	20.4112	20.4499	20.4525	20.4536	20.4427	20.3156	19.9677	19.6346 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6596	19.8568	20.0665	20.2940	20.4112	20.4499	20.4525	20.4536	20.4427	20.3156	19.9677	19.6346 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9917	0.9784	0.9515	0.8770	0.7331	0.5214	0.3566	0.3821	0.6018	0.8797	0.9773	0.9937 (94)
Useful gains	645.9826	736.9856	763.0708	732.2649	612.3707	420.3619	277.9873	291.7311	454.9454	621.1172	634.1680	618.2003 (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	1149.8834	1116.2350	1009.3658	835.4578	636.9874	422.2724	278.0933	291.9049	460.1362	710.4367	946.1663	1141.4890 (97)
Space heating kWh	374.9022	254.8556	183.2435	74.2989	18.3148	0.0000	0.0000	0.0000	0.0000	66.4538	224.6388	389.3268 (98a)
Space heating requirement - total per year (kWh/year)												1586.0344
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	374.9022	254.8556	183.2435	74.2989	18.3148	0.0000	0.0000	0.0000	0.0000	66.4538	224.6388	389.3268 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1586.0344
Space heating per m2												(98c) / (4) = 21.7528 (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	374.9022	254.8556	183.2435	74.2989	18.3148	0.0000	0.0000	0.0000	0.0000	66.4538	224.6388	389.3268 (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)	406.1779	276.1166	198.5303	80.4972	19.8427	0.0000	0.0000	0.0000	0.0000	71.9976	243.3790	421.8058 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	221.4390	195.8058	208.1921	183.7349	178.5106	161.3138	159.6583	165.8187	167.4136	186.1008	197.1290	219.1360 (64)
Efficiency of water heater (217)m	85.2306	84.6519	83.7748	82.1988	80.5597	79.8000	79.8000	79.8000	79.8000	81.9864	84.3535	79.8000 (216)
Fuel for water heating, kWh/month	259.8115	231.3071	248.5141	223.5250	221.5878	202.1476	200.0730	207.7928	209.7915	226.9898	233.6940	256.7983 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.7404	18.2432	16.4260	12.0344	9.2957	7.5947	8.4798	11.0224	14.3170	18.7847	21.2173	23.3724 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-24.7753	-36.0371	-53.4226	-62.0087	-68.5439	-64.5904	-63.8065	-59.4177	-51.9405	-42.0843	-27.6320	-21.2927 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-10.8104	-23.0469	-46.3789	-70.4971	-94.0335	-94.7786	-93.6560	-78.9150	-57.3442	-33.2258	-14.5196	-8.5253 (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												1718.3471 (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												2722.0326 (219)

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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)	183.5279 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1201.2827 (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	3508.6248 (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	1718.3471	0.2100	360.8529 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	2722.0326	0.2100	571.6268 (264)
Space and water heating			932.4797 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	183.5279	0.1443	26.4887 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-575.5515	0.1339	-77.0845
PV Unit electricity exported	-625.7312	0.1255	-78.5587
Total			-155.6432 (269)
Total CO2, kg/year			815.2545 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1718.3471	1.1300	1941.7322 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2722.0326	1.1300	3075.8968 (278)
Space and water heating			5017.6290 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	183.5279	1.5338	281.5011 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-575.5515	1.4950	-860.4215
PV Unit electricity exported	-625.7312	0.4608	-288.3542
Total			-1148.7757 (283)
Total Primary energy kWh/year			4280.4552 (286)
Target Primary Energy Rate (TPER)			58.7100 (287)

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

1. Overall dwelling characteristics

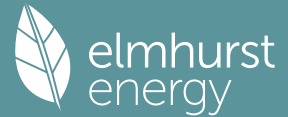
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.9118 (1b)	2.4000 (2b)	174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 174.9883 (5)

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) = 0.1714 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3714 (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) = 0.3157 (21)

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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	0.4025	0.3947	0.3868	0.3473	0.3394	0.2999	0.2999	0.2920	0.3157	0.3394	0.3552	0.3710 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688 (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						
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603			(27)					
Door 1.2			2.2360	1.2000	2.6880			(26)					
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980	(28a)					
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619	(29a)					
Total net area of external elements Aum(A, m2)			128.2041					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9307			(33)					
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590	(32)					
Party Ceiling 1			72.9100			40.0000	2916.4000	(32b)					
Internal Wall 1			120.8600			75.0000	9064.5000	(32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	24200.8189	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							331.9191	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				6.5114	0.0260		0.1693						
E3 Sill				1.4000	0.0230		0.0322						
E4 Jamb				22.5353	0.0180		0.4056						
E5 Ground floor (normal)				23.0370	0.0680		1.5665						
E7 Party floor between dwellings (in blocks of flats)				23.0370	0.0360		0.8293						
E16 Corner (normal)				4.8000	0.0400		0.1920						
E18 Party wall between dwellings				2.4000	0.0320		0.0768						
E25 Staggered party wall between dwellings				2.4000	0.0280		0.0672						
P1 Party wall - Ground floor				11.3830	0.0580		0.6602						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.9992 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		34.9299 (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	33.5518	33.3701	33.1920	32.3556	32.1991	31.4706	31.4706	31.3357	31.7512	32.1991	32.5157	32.8467	(38)
Heat transfer coeff	68.4817	68.3001	68.1220	67.2855	67.1290	66.4005	66.4005	66.2656	66.6811	67.1290	67.4456	67.7766	(39)
Average = Sum(39)m / 12 =												67.2848	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9392	0.9367	0.9343	0.9228	0.9207	0.9107	0.9107	0.9088	0.9145	0.9207	0.9250	0.9296	(40)
HLP (average)												0.9228	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

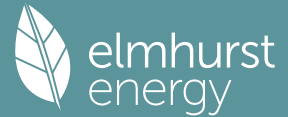
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3147	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	27.1359	(42b)
Hot water usage for other uses	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	38.3348	(42c)
Average daily hot water use (litres/day)													60.0944	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	65.5627	63.7643	61.8009	59.3570	57.1768	54.9110	54.4401	56.3996	58.4093	60.7361	63.2016	65.4706	65.4706	(44)
Energy content (annual)	103.8353	90.7996	94.9857	81.2567	76.9709	67.5195	65.8406	69.8345	72.0245	82.4183	90.0423	102.5112	102.5112	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	998.0390	(45)
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	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	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	0.0000	(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	0.0000	(59)
Total heat required for water heating calculated for each month	88.2600	77.1796	80.7378	69.0682	65.4253	57.3916	55.9645	59.3593	61.2208	70.0555	76.5360	87.1345	87.1345	(61)
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	0.0000	(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	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	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	0.0000	(63c)
Output from w/h	88.2600	77.1796	80.7378	69.0682	65.4253	57.3916	55.9645	59.3593	61.2208	70.0555	76.5360	87.1345	87.1345	(63d)
12Total per year (kWh/year)													848.3331	(64)
Electric shower(s)	50.4761	44.9746	49.1105	46.8656	47.7450	45.5441	47.0622	47.7450	46.8656	49.1105	48.1871	50.4761	50.4761	(64a)
													574.1623	(64a)
Heat gains from water heating, kWh/month	34.6840	30.5386	32.4621	28.9834	28.2926	25.7339	25.7567	26.7761	27.0216	29.7915	31.1808	34.4026	34.4026	(64a)

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

Metabolic gains (Table 5), Watts													
(66)m	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4444	121.1705	109.4444	113.0925	109.4444	113.0925	109.4444	109.4444	113.0925	109.4444	113.0925	109.4444	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.9954	206.1122	200.7779	189.4217	175.0865	161.6135	152.6126	150.4958	155.8302	167.1864	181.5215	194.9946	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735 (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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876 (71)
Water heating gains (Table 5)	46.6183	45.4443	43.6318	40.2548	38.0276	35.7416	34.6192	35.9893	37.5300	40.0424	43.3066 (72)
Total internal gains	417.7784	430.4474	411.5744	400.4893	380.2789	368.1679	354.3966	353.6499	364.1730	374.3934	395.6410 (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					1.8900	19.6403	0.5000	0.7000			0.7700	9.0035 (76)	
South					8.7306	46.7521	0.5000	0.7000			0.7700	99.0025 (78)	
Solar gains	108.0060	179.7533	235.5439	275.7361	295.0956	287.1682	279.2529	265.5266	249.4884	195.7828	128.5780	92.9513 (83)	
Total gains	525.7844	610.2007	647.1184	676.2254	675.3745	655.3360	633.6495	619.1765	613.6614	570.1762	524.2190	501.3507 (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	98.1641	98.4252	98.6825	99.9093	100.1422	101.2409	101.2409	101.4471	100.8149	100.1422	99.6721	99.1854
util living area	7.5443	7.5617	7.5788	7.6606	7.6761	7.7494	7.7494	7.7631	7.7210	7.6761	7.6448	7.6124
	0.9985	0.9948	0.9856	0.9489	0.8471	0.6403	0.4605	0.4913	0.7277	0.9532	0.9948	0.9989 (86)
MIT	20.2548	20.4064	20.5782	20.7917	20.9369	20.9936	20.9995	20.9992	20.9836	20.8132	20.4979	20.2306 (87)
Th 2	20.1343	20.1364	20.1384	20.1481	20.1500	20.1584	20.1584	20.1600	20.1552	20.1500	20.1463	20.1424 (88)
util rest of house												
	0.9978	0.9926	0.9795	0.9278	0.7947	0.5603	0.3728	0.4022	0.6488	0.9295	0.9922	0.9984 (89)
MIT 2	19.4601	19.6123	19.7826	19.9919	20.1131	20.1561	20.1583	20.1598	20.1484	20.0158	19.7120	19.4429 (90)
Living area fraction												
MIT	19.7760	19.9279	20.0988	20.3098	20.4406	20.4890	20.4927	20.4935	20.4804	20.3327	20.0244	19.7560 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7760	19.9279	20.0988	20.3098	20.4406	20.4890	20.4927	20.4935	20.4804	20.3327	20.0244	19.7560 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9974	0.9920	0.9792	0.9324	0.8138	0.5922	0.4077	0.4377	0.6802	0.9354	0.9917	0.9982 (94)
Ext temp.	524.4429	605.2943	633.6328	630.5046	549.6459	388.1149	258.3289	271.0044	417.4054	533.3564	519.8829	500.4322 (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	1059.8223	1026.4098	926.3783	767.7145	586.7448	391.0309	258.4759	271.2561	425.4496	653.3487	871.6917	1054.3327 (97)
Space heating requirement - total per year (kWh/year)	398.3223	282.9897	217.8026	98.7911	27.6016	0.0000	0.0000	0.0000	0.0000	89.2743	253.3024	412.1020 (98a)
Solar heating kWh												1780.1859
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	398.3223	282.9897	217.8026	98.7911	27.6016	0.0000	0.0000	0.0000	0.0000	89.2743	253.3024	412.1020 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1780.1859
Space heating per m2	(98c) / (4) =											24.4156 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9382	0.9793	0.9733	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	585.5863	481.2047	490.1507	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	719.6794	696.6426	681.9120	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	96.5470	160.2858	142.6704	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.1362	40.0705	35.6667	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												99.8733 (107)
Energy for space heating												24.4156 (99)
Energy for space cooling												1.3698 (108)
Total												25.7854 (109)
Fabric Energy Efficiency (DFEE)												25.8 (109)

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (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) = 0.1714 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4214 (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) = 0.3582 (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	0.4567	0.4478	0.4388	0.3940	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5741	0.5579	0.5579	0.5549	0.5642	0.5741	0.5812	0.5886 (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
TER Opaque door			2.2360	1.0000	2.2400		(26)
TER Opening Type (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Heat Loss Floor 1			72.9118	0.1300	9.4785		(28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1800	7.6378		(29a)
Total net area of external elements Aum(A, m ²)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.5167		(33)
Party Wall			27.3191	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 331.9191 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.5114	0.0500	0.3256
E3 Sill	1.4000	0.0500	0.0700
E4 Jamb	22.5353	0.0500	1.1268
E5 Ground floor (normal)	23.0370	0.1600	3.6859
E7 Party floor between dwellings (in blocks of flats)	23.0370	0.0700	1.6126
E16 Corner (normal)	4.8000	0.0900	0.4320
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E25 Staggered party wall between dwellings	2.4000	0.0600	0.1440
P1 Party wall - Ground floor	11.3830	0.0800	0.9106

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4515 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 39.9681 (37)

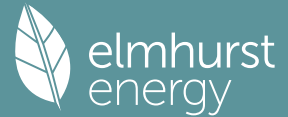
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.8962	34.6623	34.4331	33.3563	33.1548	32.2169	32.2169	32.0433	32.5782	33.1548	33.5624	33.9885 (38)
Average = Sum(39)m / 12 =	74.8644	74.6305	74.4012	73.3244	73.1229	72.1851	72.1851	72.0114	72.5463	73.1229	73.5305	73.9566 (39)
												73.3234

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0268	1.0236	1.0204	1.0057	1.0029	0.9900	0.9900	0.9877	0.9950	1.0029	1.0085	1.0143 (40)
HLP (average)												1.0056
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3147 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359 (42c)
Average daily hot water use (litres/day)	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348 (43)
												60.0944 (44)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	65.5627	63.7643	61.8009	59.3570	57.1768	54.9110	54.4401	56.3996	58.4093	60.7361	63.2016	65.4706 (44)
	103.8353	90.7996	94.9857	81.2567	76.9709	67.5195	65.8406	69.8345	72.0245	82.4183	90.0423	102.5112 (45)

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Energy content (annual)											Total = Sum(45)m =	998.0390
Distribution loss (46)m = 0.15 x (45)m												
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)	
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 (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	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	88.2600	77.1796	80.7378	69.0682	65.4253	57.3916	55.9645	59.3593	61.2208	70.0555	87.1345 (62)	
WWHRS	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 (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	88.2600	77.1796	80.7378	69.0682	65.4253	57.3916	55.9645	59.3593	61.2208	70.0555	87.1345 (64)	
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =										848.3331 (64)	
Electric shower(s)	50.4761	44.9746	49.1105	46.8656	47.7450	45.5441	47.0622	47.7450	46.8656	49.1105	50.4761 (64a)	
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =										574.1623 (64a)	
Heat gains from water heating, kWh/month	34.6840	30.5386	32.4621	28.9834	28.2926	25.7339	25.7567	26.7761	27.0216	29.7915	34.4026 (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	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4444	121.1705	109.4444	113.0925	109.4444	113.0925	109.4444	109.4444	113.0925	109.4444	113.0925	109.4444 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.9954	206.1122	200.7779	189.4217	175.0865	161.6135	152.6126	150.4958	155.8302	167.1864	181.5215	194.9946 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735 (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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876 (71)
Water heating gains (Table 5)	46.6183	45.4443	43.6318	40.2548	38.0276	35.7416	34.6192	35.9893	37.5300	40.0424	43.3066	46.2401 (72)
Total internal gains	417.7784	430.4474	411.5744	400.4893	380.2789	368.1679	354.3966	353.6499	364.1730	374.3934	395.6410	408.3994 (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			1.8900		19.6403		0.6300		0.7000		0.7700		11.3444 (76)
South			8.7306		46.7521		0.6300		0.7000		0.7700		124.7431 (78)
Solar gains	136.0875	226.4891	296.7853	347.4275	371.8205	361.8319	351.8587	334.5635	314.3554	246.6863	162.0082		117.1186 (83)
Total gains	553.8659	656.9365	708.3598	747.9168	752.0994	729.9997	706.2552	688.2134	678.5284	621.0797	557.6493		525.5180 (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	89.7951	90.0765	90.3540	91.6809	91.9335	93.1280	93.1280	93.3526	92.6642	91.9335	91.4240	90.8972
alpha	6.9863	7.0051	7.0236	7.1121	7.1289	7.2085	7.2085	7.2235	7.1776	7.1289	7.0949	7.0598
util living area	0.9981	0.9933	0.9815	0.9379	0.8286	0.6241	0.4489	0.4801	0.7140	0.9464	0.9938	0.9987 (86)
MIT	20.1708	20.3470	20.5435	20.7784	20.9322	20.9923	20.9993	20.9990	20.9807	20.7939	20.4422	20.1452 (87)
Th 2	20.0611	20.0637	20.0663	20.0786	20.0809	20.0916	20.0916	20.0936	20.0875	20.0809	20.0763	20.0714 (88)
util rest of house	0.9973	0.9906	0.9737	0.9130	0.7716	0.5400	0.3567	0.3862	0.6305	0.9195	0.9907	0.9981 (89)
MIT 2	19.3149	19.4917	19.6860	19.9154	20.0421	20.0890	20.0915	20.0934	20.0797	19.9352	19.5974	19.2980 (90)
Living area fraction	19.6551	19.8316	20.0268	20.2584	20.3959	20.4480	20.4524	20.4533	20.4378	20.2765	19.9332	19.6348 (92)
MIT	19.6551	19.8316	20.0268	20.2584	20.3959	20.4480	20.4524	20.4533	20.4378	20.2765	19.9332	19.6348 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6551	19.8316	20.0268	20.2584	20.3959	20.4480	20.4524	20.4533	20.4378	20.2765	19.9332	19.6348 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9968	0.9897	0.9733	0.9185	0.7924	0.5735	0.3935	0.4236	0.6637	0.9262	0.9901	0.9977 (94)
Useful gains	552.1135	650.1833	689.4246	686.9457	595.9869	418.6674	277.8789	291.5444	450.3195	575.2183	552.1088	524.3291 (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	1149.5513	1114.3550	1006.4110	832.8510	635.8692	422.1404	278.0826	291.8873	459.7867	707.5742	943.6297	1141.5023 (97)
Space heating kWh	444.4938	311.9233	235.8379	105.0518	29.6724	0.0000	0.0000	0.0000	0.0000	98.4727	281.8950	459.1768 (98a)
Space heating requirement - total per year (kWh/year)												1966.5239
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	444.4938	311.9233	235.8379	105.0518	29.6724	0.0000	0.0000	0.0000	0.0000	98.4727	281.8950	459.1768 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1966.5239
Space heating per m2										(98c) / (4) =		26.9713 (99)

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8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	678.5398	534.1697	547.2867	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9399	0.9787	0.9725	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	637.7519	522.7843	532.2365	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	806.9486	781.5065	762.6045	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	121.8216	192.4893	171.3938	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.4547	48.1211	42.8474	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												121.4232 (107)
Energy for space heating												26.9713 (99)
Energy for space cooling												1.6653 (108)
Total												28.6366 (109)
Fabric Energy Efficiency (TFEE)												28.6 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (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	2 * 10 = 20.0000 (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) = 20.0000 / (5) = 0.1143 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3143 (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) = 0.2671 (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	0.3406	0.3339	0.3273	0.2939	0.2872	0.2538	0.2538	0.2471	0.2671	0.2872	0.3005	0.3139 (22b)
Effective ac	0.5580	0.5558	0.5535	0.5432	0.5412	0.5322	0.5322	0.5305	0.5357	0.5412	0.5452	0.5493 (25)

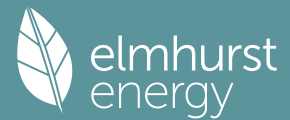
3. Heat losses and heat loss parameter

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
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980 (28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619 (29a)
Total net area of external elements Aum(A, m ²)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9307		(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590 (32)
Party Ceiling 1			72.9100			40.0000	2916.4000 (32b)
Internal Wall 1			120.8600			75.0000	9064.5000 (32c)

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

	Length	Psi-value	Total
K1 Element	6.5114	0.0260	0.1693
E2 Other lintels (including other steel lintels)	1.4000	0.0230	0.0322
E3 Sill	22.5353	0.0180	0.4056
E4 Jamb	23.0370	0.0680	1.5665
E5 Ground floor (normal)	23.0370	0.0360	0.8293
E7 Party floor between dwellings (in blocks of flats)			

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E16 Corner (normal)						4.8000	0.0400	0.1920				
E18 Party wall between dwellings						2.4000	0.0320	0.0768				
E25 Staggered party wall between dwellings						2.4000	0.0280	0.0672				
P1 Party wall - Ground floor						11.3830	0.0580	0.6602				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											3.9992	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	34.9299 (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	32.2229	32.0928	31.9653	31.3664	31.2544	30.7328	30.7328	30.6362	30.9337	31.2544	31.4811	31.7180 (38)
Average = Sum(39)m / 12 =	67.1528	67.0228	66.8953	66.2964	66.1843	65.6627	65.6627	65.5661	65.8636	66.1843	66.4110	66.6480 (39)
												66.2958
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9210	0.9192	0.9175	0.9093	0.9077	0.9006	0.9006	0.8993	0.9033	0.9077	0.9108	0.9141 (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												2.3147 (42)
Hot water usage for mixer showers												86.3334 (42a)
Hot water usage for baths												27.1359 (42b)
Hot water usage for other uses												38.3348 (42c)
Average daily hot water use (litres/day)												139.9970 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040 (44)
Energy content (annual)	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885 (45)
Distribution loss (46)m = 0.15 x (45)m												2325.3646
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss												
If cylinder contains dedicated solar storage												
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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (64)
Electric shower(s)												
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												2894.9106 (64)
Heat gains from water heating, kWh/month												
	118.8611	105.5611	112.9347	100.8059	98.8257	90.2223	89.7311	92.5284	92.7284	102.0283	106.8642	117.7293 (65)

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

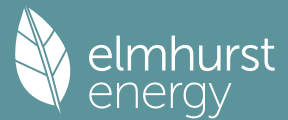
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	23.6198	20.9789	17.0612	12.9164	9.6552	8.1513	8.8078	11.4487	15.3664	19.5111	22.7724	24.2762 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	304.4707	307.6302	299.6685	282.7189	261.3231	241.2141	227.7801	224.6206	232.5823	249.5319	270.9277	291.0367 (68)
Pumps, fans	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876 (71)
Total internal gains	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383 (72)
	585.3467	583.1907	566.0203	533.1402	501.3051	472.1708	454.6908	457.9320	474.2349	503.6745	539.6192	571.0479 (73)

6. Solar gains

[Jan]												
			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
East			1.8900	19.6403	0.5000	0.7000	0.7700	9.0035 (76)				
South			8.7306	46.7521	0.5000	0.7000	0.7700	99.0025 (78)				
Solar gains	108.0060	179.7533	235.5439	275.7361	295.0956	287.1682	279.2529	265.5266	249.4884	195.7828	128.5780	92.9513 (83)
Total gains	693.3526	762.9440	801.5642	808.8763	796.4008	759.3390	733.9437	723.4586	723.7232	699.4572	668.1972	663.9992 (84)

7. Mean internal temperature (heating season)

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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	100.1067	100.3010	100.4922	101.4000	101.5716	102.3785	102.3785	102.5293	102.0662	101.5716	101.2249	100.8650
alpha	7.6738	7.6867	7.6995	7.7600	7.7714	7.8252	7.8252	7.8353	7.8044	7.7714	7.7483	7.7243
util living area												
	0.9903	0.9785	0.9506	0.8821	0.7464	0.5510	0.3935	0.4166	0.6217	0.8788	0.9760	0.9927 (86)
Living	20.5656	20.6583	20.7711	20.8795	20.9408	20.9586	20.9601	20.9601	20.9560	20.8931	20.7140	20.5421
Non living	19.6557	19.7721	19.9093	20.0370	20.0964	20.1152	20.1159	20.1171	20.1115	20.0544	19.8487	19.6314
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	20.7778	20.6583	20.7711	20.8795	20.9408	20.9586	20.9601	20.9601	20.9560	20.8931	20.7140	20.6062 (87)
Th 2	20.1497	20.1512	20.1527	20.1596	20.1609	20.1670	20.1670	20.1681	20.1647	20.1609	20.1583	20.1555 (88)
util rest of house												
	0.9867	0.9709	0.9340	0.8472	0.6890	0.4806	0.3191	0.3415	0.5495	0.8370	0.9661	0.9900 (89)
MIT 2	19.9527	19.7721	19.9093	20.0370	20.0964	20.1152	20.1159	20.1171	20.1115	20.0544	19.8487	19.7258 (90)
Living area fraction												
MIT	20.2807	20.1243	20.2518	20.3718	20.4320	20.4504	20.4515	20.4522	20.4471	20.3877	20.1926	20.0757 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2807	20.1243	20.2518	20.3718	20.4320	20.4504	20.4515	20.4522	20.4471	20.3877	20.1926	20.0757 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9873	0.9707	0.9362	0.8567	0.7081	0.5047	0.3445	0.3672	0.5742	0.8492	0.9666	0.9896 (94)
Useful gains	684.5618	740.5552	750.4163	692.9944	563.9674	383.2357	252.8588	265.6202	415.5895	593.9904	645.8583	657.1172 (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	1073.1466	1020.3745	919.9334	760.5404	577.9240	384.1554	252.8985	265.6858	418.0455	647.7953	869.4956	1058.0856 (97)
Space heating kWh	289.1071	188.0386	126.1207	48.6331	10.3837	0.0000	0.0000	0.0000	0.0000	40.0309	161.0189	298.3205 (98a)
Space heating requirement - total per year (kWh/year)												1161.6533
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	289.1071	188.0386	126.1207	48.6331	10.3837	0.0000	0.0000	0.0000	0.0000	40.0309	161.0189	298.3205 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1161.6533
Space heating per m2										(98c) / (4) =		15.9323 (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 %)												220.9462 (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	289.1071	188.0386	126.1207	48.6331	10.3837	0.0000	0.0000	0.0000	0.0000	40.0309	161.0189	298.3205 (98)
Space heating efficiency (main heating system 1)	220.9462	220.9462	220.9462	220.9462	220.9462	0.0000	0.0000	0.0000	0.0000	220.9462	220.9462	220.9462 (210)
Space heating fuel (main heating system)	130.8495	85.1060	57.0821	22.0113	4.6997	0.0000	0.0000	0.0000	0.0000	18.1179	72.8769	135.0195 (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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (64)
Efficiency of water heater (217)m	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602 (216)
Fuel for water heating, kWh/month	167.4558	148.1235	157.1448	137.3117	132.5971	118.8977	116.7739	121.6407	123.2580	138.1692	147.8522	165.4868 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (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												525.7629 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												172.8602
Water heating fuel used												1674.7116 (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)												166.8530 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

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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	2367.3275 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	525.7629	16.4900	86.6983 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1674.7116	16.4900	276.1599 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	166.8530	16.4900	27.5141 (250)
Additional standing charges			0.0000 (251)
Total energy cost			390.3723 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.1919 (257)
SAP value	80.6800
SAP rating (Section 12)	81 (258)
SAP band	B

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	525.7629	0.1577	82.9236 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1674.7116	0.1410	236.1585 (264)
Space and water heating			319.0821 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	166.8530	0.1443	24.0820 (268)
Total CO2, kg/year			343.1642 (272)
CO2 emissions per m2			4.7100 (273)
EI value			96.1001
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (5)

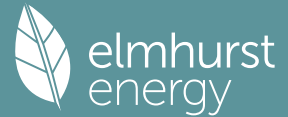
2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1143 (8)
Pressure Test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.3143	(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) =		0.2671 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												

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Effective ac	0.2805	0.2671	0.2671	0.2471	0.2471	0.2204	0.2271	0.2137	0.2204	0.2338	0.2338	0.2538 (22b)
	0.5393	0.5357	0.5357	0.5305	0.5305	0.5243	0.5258	0.5228	0.5243	0.5273	0.5273	0.5322 (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
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980 (28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619 (29a)
Total net area of external elements Aum(A, m ²)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9307		(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590 (32)
Party Ceiling 1			72.9100			40.0000	2916.4000 (32b)
Internal Wall 1			120.8600			75.0000	9064.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24200.8189 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 331.9191 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.5114	0.0260	0.1693
E3 Sill	1.4000	0.0230	0.0322
E4 Jamb	22.5353	0.0180	0.4056
E5 Ground floor (normal)	23.0370	0.0680	1.5665
E7 Party floor between dwellings (in blocks of flats)	23.0370	0.0360	0.8293
E16 Corner (normal)	4.8000	0.0400	0.1920
E18 Party wall between dwellings	2.4000	0.0320	0.0768
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672
P1 Party wall - Ground floor	11.3830	0.0580	0.6602

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.9992 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.9299 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.1449	30.9337	30.9337	30.6362	30.6362	30.2756	30.3619	30.1919	30.2756	30.4507	30.4507	30.7328 (38)
Heat transfer coeff	66.0749	65.8636	65.8636	65.5661	65.5661	65.2055	65.2918	65.1218	65.2055	65.3807	65.3807	65.6627 (39)
Average = Sum(39)m / 12 =												65.5153

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9062	0.9033	0.9033	0.8993	0.8993	0.8943	0.8955	0.8932	0.8943	0.8967	0.8967	0.9006 (40)
HLP (average)												0.8986
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3147 (42)
Hot water usage for mixer showers	86.6655	85.3630	83.4652	79.8339	77.1542	74.1657	72.4671	74.3506	76.4153	79.6240	83.3332	86.3334 (42a)
Hot water usage for baths	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359 (42b)
Hot water usage for other uses	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348 (42c)
Average daily hot water use (litres/day)												139.9970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040 (44)
Energy conte	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885 (45)
Energy content (annual)										Total = Sum(45)m =		2325.3646
Distribution loss (46)m = 0.15 x (45)m	36.1638	31.8533	33.4903	28.5818	27.1253	23.8072	23.0225	24.2844	24.9378	28.5701	31.3149	35.6533 (46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.5000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8100 (55)

Total storage loss 25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 25.1100 24.3000 25.1100 24.3000 25.1100 (56)

If cylinder contains dedicated solar storage 25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 25.1100 24.3000 25.1100 24.3000 25.1100 (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 289.4646 256.0466 271.6409 237.3574 229.2077 205.5269 201.8557 210.2685 213.0642 238.8396 255.5777 286.0609 (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 289.4646 256.0466 271.6409 237.3574 229.2077 205.5269 201.8557 210.2685 213.0642 238.8396 255.5777 286.0609 (64)

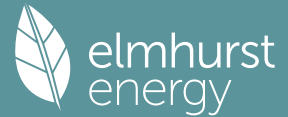
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Heat gains from water heating, kWh/month 118.8611 105.5611 112.9347 100.8059 98.8257 90.2223 89.7311 92.5284 92.7284 102.0283 106.8642 117.7293 (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	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.6198	20.9789	17.0612	12.9164	9.6552	8.1513	8.8078	11.4487	15.3664	19.5111	22.7724	24.2762 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	304.4707	307.6302	299.6685	282.7189	261.3231	241.2141	227.7801	224.6206	232.5823	249.5319	270.9277	291.0367 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028 (69)

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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)											
	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876 (71)
Water heating gains (Table 5)												
	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383 (72)
Total internal gains												
	585.3467	583.1907	566.0203	533.1402	501.3051	472.1708	454.6908	457.9320	474.2349	503.6745	539.6192	571.0479 (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				1.8900	22.3313	0.5000	0.7000	0.7700	10.2371 (76)			
South				8.7306	50.9848	0.5000	0.7000	0.7700	107.9658 (78)			
Solar gains	118.2029	176.6990	228.5998	276.8333	290.4073	303.4820	291.4757	281.8234	262.7023	205.3717	144.0748	100.8090 (83)
Total gains	703.5496	759.8898	794.6200	809.9735	791.7124	775.6528	746.1665	739.7554	736.9372	709.0461	683.6940	671.8570 (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	101.7399	102.0662	102.0662	102.5293	102.5293	103.0963	102.9601	103.2288	103.0963	102.8201	102.8201	102.3785
alpha	7.7827	7.8044	7.8044	7.8353	7.8353	7.8731	7.8640	7.8819	7.8731	7.8547	7.8547	7.8252
util living area												
	0.9850	0.9714	0.9320	0.8340	0.6534	0.4201	0.2713	0.2817	0.5119	0.8145	0.9586	0.9884 (86)
Living	20.6354	20.7093	20.8192	20.9128	20.9537	20.9603	20.9604	20.9605	20.9596	20.9267	20.7835	20.6150
Non living	19.7542	19.8468	19.9762	20.0785	20.1134	20.1216	20.1205	20.1226	20.1213	20.0948	19.9426	19.7332
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	20.8135	20.7093	20.8192	20.9128	20.9537	20.9603	20.9604	20.9605	20.9596	20.9267	20.7835	20.6689 (87)
Th 2	20.1622	20.1647	20.1647	20.1681	20.1681	20.1723	20.1713	20.1733	20.1723	20.1703	20.1703	20.1670 (88)
util rest of house												
	0.9793	0.9613	0.9098	0.7902	0.5895	0.3507	0.1987	0.2089	0.4396	0.7605	0.9422	0.9839 (89)
MIT 2	19.9995	19.8468	19.9762	20.0785	20.1134	20.1216	20.1205	20.1226	20.1213	20.0948	19.9426	19.8114 (90)
Living area fraction												
MIT	20.3230	20.1897	20.3113	20.4101	20.4474	20.4549	20.4544	20.4557	20.4545	20.4254	20.2769	20.1522 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3230	20.1897	20.3113	20.4101	20.4474	20.4549	20.4544	20.4557	20.4545	20.4254	20.2769	20.1522 (93)

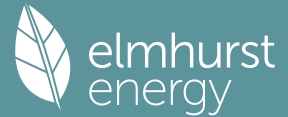
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9805	0.9616	0.9141	0.8037	0.6113	0.3744	0.2235	0.2338	0.4643	0.7780	0.9446	0.9838 (94)
Useful gains	689.8649	730.7459	726.3596	650.9742	483.9934	290.4059	166.7783	172.9404	342.1796	551.6223	645.7978	661.0040 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1005.8605	960.9281	850.3832	689.1069	488.2964	290.4855	166.7793	172.9418	342.6212	577.0131	802.6690	988.3698 (97)
Space heating kWh	235.1007	154.6824	92.2735	27.4556	3.2014	0.0000	0.0000	0.0000	0.0000	18.8907	112.9473	243.5601 (98a)
Space heating requirement - total per year (kWh/year)												888.1118
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	235.1007	154.6824	92.2735	27.4556	3.2014	0.0000	0.0000	0.0000	0.0000	18.8907	112.9473	243.5601 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												888.1118
Space heating per m2										(98c) / (4) =		12.1806 (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 %)												220.9946 (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
	235.1007	154.6824	92.2735	27.4556	3.2014	0.0000	0.0000	0.0000	0.0000	18.8907	112.9473	243.5601 (98)
Space heating efficiency (main heating system 1)	220.9946	220.9946	220.9946	220.9946	220.9946	0.0000	0.0000	0.0000	0.0000	220.9946	220.9946	220.9946 (210)
Space heating fuel (main heating system)	106.3830	69.9938	41.7538	12.4236	1.4486	0.0000	0.0000	0.0000	0.0000	8.5481	51.1086	110.2109 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (64)
Efficiency of water heater (217)m	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939 (216)
Fuel for water heating, kWh/month	167.3264	148.0090	157.0234	137.2056	132.4946	118.8059	116.6837	121.5467	123.1628	138.0624	147.7380	165.3589 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (232)

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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												401.8704	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												172.9939	
Water heating fuel used												1673.4176	(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)												166.8530	(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												2242.1410	(238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	401.8704	26.0600	104.7274	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1673.4176	26.0600	436.0926	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	166.8530	26.0600	43.4819	(250)
Additional standing charges			0.0000	(251)
Total energy cost			584.3019	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	401.8704	0.1586	63.7399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1673.4176	0.1410	235.9760	(264)
Space and water heating			299.7159	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	166.8530	0.1443	24.0820	(268)
Total CO2, kg/year			323.7980	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	401.8704	1.5871	637.8197	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1673.4176	1.5214	2545.9812	(278)
Space and water heating			3183.8009	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	166.8530	1.5338	255.9247	(282)
Total Primary energy kWh/year			3439.7256	(286)

SAP 10 EPC IMPROVEMENTS

Be Green Act

Current energy efficiency rating:	B 81
Current environmental impact rating:	A 96

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

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

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

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Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96
Fuel prices for cost data on this page from database revision number 560 TEST (06 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£584	£584	£0
Space heating	£105	£105	£0
Water heating	£436	£436	£0
Lighting	£43	£43	£0
Total cost of fuels	£584	£584	£0
Total cost of uses	£584	£584	£0
Delivered energy	31 kWh/m²	31 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	47 kWh/m²	47 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) = 0.1143 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3143 (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) = 0.2671 (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	0.3406	0.3339	0.3273	0.2939	0.2872	0.2538	0.2538	0.2471	0.2671	0.2872	0.3005	0.3139 (22b)
Effective ac	0.5580	0.5558	0.5535	0.5432	0.5412	0.5322	0.5322	0.5305	0.5357	0.5412	0.5452	0.5493 (25)

3. Heat losses and heat loss parameter

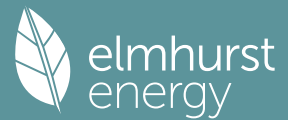
Element	Gross m²	Openings m²	NetArea m²	U-value W/m²K	A x U W/K	K-value kJ/m²K	A x K kJ/K
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980 (28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619 (29a)
Total net area of external elements Aum(A, m²)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9307		(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590 (32)
Party Ceiling 1			72.9100			40.0000	2916.4000 (32b)
Internal Wall 1			120.8600			75.0000	9064.5000 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 24200.8189 (34)
331.9191 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.5114	0.0260	0.1693
E3 Sill	1.4000	0.0230	0.0322
E4 Jamb	22.5353	0.0180	0.4056
E5 Ground floor (normal)	23.0370	0.0680	1.5665
E7 Party floor between dwellings (in blocks of flats)	23.0370	0.0360	0.8293
E16 Corner (normal)	4.8000	0.0400	0.1920
E18 Party wall between dwellings	2.4000	0.0320	0.0768

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E25 Staggered party wall between dwellings					2.4000		0.0280		0.0672				
P1 Party wall - Ground floor					11.3830		0.0580		0.6602				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges												(36a) = 3.9992 (36)	
Total fabric heat loss												(33) + (36) + (36a) = 34.9299 (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	
	32.2229	32.0928	31.9653	31.3664	31.2544	30.7328	30.7328	30.6362	30.9337	31.2544	31.4811	31.7180	(38)
Heat transfer coeff	67.1528	67.0228	66.8953	66.2964	66.1843	65.6627	65.6627	65.5661	65.8636	66.1843	66.4110	66.6480	(39)
Average = Sum(39)m / 12 =												66.2958	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9210	0.9192	0.9175	0.9093	0.9077	0.9006	0.9006	0.8993	0.9033	0.9077	0.9108	0.9141	(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													2.3147 (42)
Hot water usage for mixer showers													
86.6655	85.3630	83.4652	79.8339	77.1542	74.1657	72.4671	74.3506	76.4153	79.6240	83.3332	86.3334	(42a)	
Hot water usage for baths													
27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	(42b)	
Hot water usage for other uses													
38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	(42c)	
Average daily hot water use (litres/day)												139.9970	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040	(44)
Energy conte	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885	(45)
Energy content (annual)										Total =	Sum(45)m =	2325.3646	
Distribution loss (46)m = 0.15 x (45)m													
36.1638	31.8533	33.4903	28.5818	27.1253	23.8072	23.0225	24.2844	24.9378	28.5701	31.3149	35.6533	(46)	
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss													
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)	
If cylinder contains dedicated solar storage													
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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													
289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609	(62)	
WWHRS	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	(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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609	(64)
												2894.9106	(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													
118.8611	105.5611	112.9347	100.8059	98.8257	90.2223	89.7311	92.5284	92.7284	102.0283	106.8642	117.7293	(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	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	23.6198	20.9789	17.0612	12.9164	9.6552	8.1513	8.8078	11.4487	15.3664	19.5111	22.7724	24.2762	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	304.4707	307.6302	299.6685	282.7189	261.3231	241.2141	227.7801	224.6206	232.5823	249.5319	270.9277	291.0367	(68)
Pumps, fans	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	(71)
Total internal gains	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383	(72)
	585.3467	583.1907	566.0203	533.1402	501.3051	472.1708	454.6908	457.9320	474.2349	503.6745	539.6192	571.0479	(73)

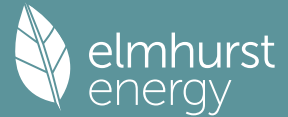
6. Solar gains

[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				1.8900	19.6403	0.5000		0.7000		0.7700	9.0035 (76)	
South				8.7306	46.7521	0.5000		0.7000		0.7700	99.0025 (78)	
Solar gains	108.0060	179.7533	235.5439	275.7361	295.0956	287.1682	279.2529	265.5266	249.4884	195.7828	128.5780	92.9513 (83)
Total gains	693.3526	762.9440	801.5642	808.8763	796.4008	759.3390	733.9437	723.4586	723.7232	699.4572	668.1972	663.9992 (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)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	100.1067	100.3010	100.4922	101.4000	101.5716	102.3785	102.3785	102.5293	102.0662	101.5716	101.2249	100.8650
alpha	7.6738	7.6867	7.6995	7.7600	7.7714	7.8252	7.8252	7.8353	7.8044	7.7714	7.7483	7.7243
util living area	0.9903	0.9785	0.9506	0.8821	0.7464	0.5510	0.3935	0.4166	0.6217	0.8788	0.9760	0.9927 (86)
Living	20.5656	20.6583	20.7711	20.8795	20.9408	20.9586	20.9601	20.9601	20.9560	20.8931	20.7140	20.5421
Non living	19.6557	19.7721	19.9093	20.0370	20.0964	20.1152	20.1159	20.1171	20.1115	20.0544	19.8487	19.6314
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	20.7778	20.6583	20.7711	20.8795	20.9408	20.9586	20.9601	20.9601	20.9560	20.8931	20.7140	20.6062 (87)
Th 2	20.1497	20.1512	20.1527	20.1596	20.1609	20.1670	20.1670	20.1681	20.1647	20.1609	20.1583	20.1555 (88)
util rest of house	0.9867	0.9709	0.9340	0.8472	0.6890	0.4806	0.3191	0.3415	0.5495	0.8370	0.9661	0.9900 (89)
MIT 2	19.9527	19.7721	19.9093	20.0370	20.0964	20.1152	20.1159	20.1171	20.1115	20.0544	19.8487	19.7258 (90)
Living area fraction									fLA = Living area / (4) =			0.3975 (91)
MIT	20.2807	20.1243	20.2518	20.3718	20.4320	20.4504	20.4515	20.4522	20.4471	20.3877	20.1926	20.0757 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2807	20.1243	20.2518	20.3718	20.4320	20.4504	20.4515	20.4522	20.4471	20.3877	20.1926	20.0757 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9873	0.9707	0.9362	0.8567	0.7081	0.5047	0.3445	0.3672	0.5742	0.8492	0.9666	0.9896 (94)
Useful gains	684.5618	740.5552	750.4163	692.9944	563.9674	383.2357	252.8588	265.6202	415.5895	593.9904	645.8583	657.1172 (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	1073.1466	1020.3745	919.9334	760.5404	577.9240	384.1554	252.8985	265.6858	418.0455	647.7953	869.4956	1058.0856 (97)
Space heating kWh	289.1071	188.0386	126.1207	48.6331	10.3837	0.0000	0.0000	0.0000	0.0000	40.0309	161.0189	298.3205 (98a)
Space heating requirement - total per year (kWh/year)												1161.6533
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	289.1071	188.0386	126.1207	48.6331	10.3837	0.0000	0.0000	0.0000	0.0000	40.0309	161.0189	298.3205 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1161.6533
Space heating per m2										(98c) / (4) =		15.9323 (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 %)												220.9462 (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	289.1071	188.0386	126.1207	48.6331	10.3837	0.0000	0.0000	0.0000	0.0000	40.0309	161.0189	298.3205 (98)
Space heating efficiency (main heating system 1)	220.9462	220.9462	220.9462	220.9462	220.9462	0.0000	0.0000	0.0000	0.0000	220.9462	220.9462	220.9462 (210)
Space heating fuel (main heating system)	130.8495	85.1060	57.0821	22.0113	4.6997	0.0000	0.0000	0.0000	0.0000	18.1179	72.8769	135.0195 (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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (64)
Efficiency of water heater (217)m	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602	172.8602 (216)
Fuel for water heating, kWh/month	167.4558	148.1235	157.1448	137.3117	132.5971	118.8977	116.7739	121.6407	123.2580	138.1692	147.8522	165.4868 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (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												525.7629 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												172.8602
Water heating fuel used												1674.7116 (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)												166.8530 (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)

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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	2367.3275 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	525.7629	16.4900	86.6983 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1674.7116	16.4900	276.1599 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	166.8530	16.4900	27.5141 (250)
Additional standing charges			0.0000 (251)
Total energy cost			390.3723 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.1919 (257)
SAP value	80.6800
SAP rating (Section 12)	81 (258)
SAP band	B

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	525.7629	0.1577	82.9236 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1674.7116	0.1410	236.1585 (264)
Space and water heating			319.0821 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	166.8530	0.1443	24.0820 (268)
Total CO2, kg/year			343.1642 (272)
CO2 emissions per m2			4.7100 (273)
EI value			96.1001
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

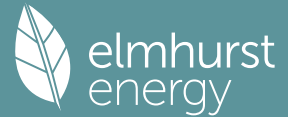
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1143 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3143 (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) = 0.2671 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2805	0.2671	0.2671	0.2471	0.2471	0.2204	0.2271	0.2137	0.2204	0.2338	0.2338	0.2538 (22b)
Effective ac	0.5393	0.5357	0.5357	0.5305	0.5305	0.5243	0.5258	0.5228	0.5243	0.5273	0.5273	0.5322 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980	(28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619	(29a)
Total net area of external elements Aum(A, m2)			128.2041					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9307			(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590	(32)
Party Ceiling 1			72.9100			40.0000	2916.4000	(32b)
Internal Wall 1			120.8600			75.0000	9064.5000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24200.8189 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 331.9191 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.5114	0.0260	0.1693
E3 Sill	1.4000	0.0230	0.0322
E4 Jamb	22.5353	0.0180	0.4056
E5 Ground floor (normal)	23.0370	0.0680	1.5665
E7 Party floor between dwellings (in blocks of flats)	23.0370	0.0360	0.8293
E16 Corner (normal)	4.8000	0.0400	0.1920
E18 Party wall between dwellings	2.4000	0.0320	0.0768
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672
P1 Party wall - Ground floor	11.3830	0.0580	0.6602

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.9992 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.9299 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.1449	30.9337	30.9337	30.6362	30.6362	30.2756	30.3619	30.1919	30.2756	30.4507	30.4507	30.7328
Heat transfer coeff	66.0749	65.8636	65.8636	65.5661	65.5661	65.2055	65.2918	65.1218	65.2055	65.3807	65.3807	65.6627
Average = Sum(39)m / 12 =												65.5153

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9062	0.9033	0.9033	0.8993	0.8993	0.8943	0.8955	0.8932	0.8943	0.8967	0.8967	0.9006
HLP (average)												0.8986
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3147 (42)
Hot water usage for mixer showers	86.6655	85.3630	83.4652	79.8339	77.1542	74.1657	72.4671	74.3506	76.4153	79.6240	83.3332	86.3334 (42a)
Hot water usage for baths	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359 (42b)
Hot water usage for other uses	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348 (42c)
Average daily hot water use (litres/day)												139.9970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040 (44)
Energy conte	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885 (45)
Energy content (annual)												Total = Sum(45)m = 2325.3646

Distribution loss (46)m = 0.15 x (45)m
36.1638 31.8533 33.4903 28.5818 27.1253 23.8072 23.0225 24.2844 24.9378 28.5701 31.3149 35.6533 (46)

Water storage loss:
Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b 1.5000 (48)

Enter (49) or (54) in (55) 0.5400 (49)

Total storage loss 0.8100 (55)

25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 25.1100 24.3000 25.1100 24.3000 25.1100 (56)

If cylinder contains dedicated solar storage 25.1100 22.6800 25.1100 24.3000 25.1100 24.3000 25.1100 25.1100 24.3000 25.1100 24.3000 25.1100 (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

289.4646 256.0466 271.6409 237.3574 229.2077 205.5269 201.8557 210.2685 213.0642 238.8396 255.5777 286.0609 (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 289.4646 256.0466 271.6409 237.3574 229.2077 205.5269 201.8557 210.2685 213.0642 238.8396 255.5777 286.0609 (64)

Total per year (kWh/year) = Sum(64)m = 2894.9106 (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)

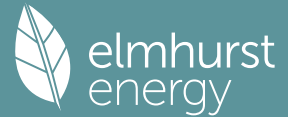
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 118.8611 105.5611 112.9347 100.8059 98.8257 90.2223 89.7311 92.5284 92.7284 102.0283 106.8642 117.7293 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.6198	20.9789	17.0612	12.9164	9.6552	8.1513	8.8078	11.4487	15.3664	19.5111	22.7724	24.2762 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	304.4707	307.6302	299.6685	282.7189	261.3231	241.2141	227.7801	224.6206	232.5823	249.5319	270.9277	291.0367 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028 (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)												

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	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876 (71)
Water heating gains (Table 5)	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383 (72)
Total internal gains	585.3467	583.1907	566.0203	533.1402	501.3051	472.1708	454.6908	457.9320	474.2349	503.6745	539.6192	571.0479 (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	1.8900		22.3313		0.5000		0.7000		0.7700		10.2371 (76)	
South	8.7306		50.9848		0.5000		0.7000		0.7700		107.9658 (78)	
Solar gains	118.2029	176.6990	228.5998	276.8333	290.4073	303.4820	291.4757	281.8234	262.7023	205.3717	144.0748	100.8090 (83)
Total gains	703.5496	759.8898	794.6200	809.9735	791.7124	775.6528	746.1665	739.7554	736.9372	709.0461	683.6940	671.8570 (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	101.7399	102.0662	102.0662	102.5293	102.5293	103.0963	102.9601	103.2288	103.0963	102.8201	102.8201	102.3785
alpha	7.7827	7.8044	7.8044	7.8353	7.8353	7.8731	7.8640	7.8819	7.8731	7.8547	7.8547	7.8252
util living area	0.9850	0.9714	0.9320	0.8340	0.6534	0.4201	0.2713	0.2817	0.5119	0.8145	0.9586	0.9884 (86)
Living	20.6354	20.7093	20.8192	20.9128	20.9537	20.9603	20.9604	20.9605	20.9596	20.9267	20.7835	20.6150
Non living	19.7542	19.8468	19.9762	20.0785	20.1134	20.1216	20.1205	20.1226	20.1213	20.0948	19.9426	19.7332
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	20.8135	20.7093	20.8192	20.9128	20.9537	20.9603	20.9604	20.9605	20.9596	20.9267	20.7835	20.6689 (87)
Th 2	20.1622	20.1647	20.1647	20.1681	20.1681	20.1723	20.1713	20.1733	20.1723	20.1703	20.1703	20.1670 (88)
util rest of house	0.9793	0.9613	0.9098	0.7902	0.5895	0.3507	0.1987	0.2089	0.4396	0.7605	0.9422	0.9839 (89)
MIT 2	19.9995	19.8468	19.9762	20.0785	20.1134	20.1216	20.1205	20.1226	20.1213	20.0948	19.9426	19.8114 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	20.3230	20.1897	20.3113	20.4101	20.4474	20.4549	20.4544	20.4557	20.4545	20.4254	20.2769	20.1522 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.3230	20.1897	20.3113	20.4101	20.4474	20.4549	20.4544	20.4557	20.4545	20.4254	20.2769	20.1522 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9805	0.9616	0.9141	0.8037	0.6113	0.3744	0.2235	0.2338	0.4643	0.7780	0.9446	0.9838 (94)
Useful gains	689.8649	730.7459	726.3596	650.9742	483.9934	290.4059	166.7783	172.9404	342.1796	551.6223	645.7978	661.0040 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1005.8605	960.9281	850.3832	689.1069	488.2964	290.4855	166.7793	172.9418	342.6212	577.0131	802.6690	988.3698 (97)
Space heating kWh	235.1007	154.6824	92.2735	27.4556	3.2014	0.0000	0.0000	0.0000	0.0000	18.8907	112.9473	243.5601 (98a)
Space heating requirement - total per year (kWh/year)	888.1118											
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	235.1007	154.6824	92.2735	27.4556	3.2014	0.0000	0.0000	0.0000	0.0000	18.8907	112.9473	243.5601 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	888.1118											
Space heating per m2	(98c) / (4) = 12.1806 (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 %)												220.9946 (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	235.1007	154.6824	92.2735	27.4556	3.2014	0.0000	0.0000	0.0000	0.0000	18.8907	112.9473	243.5601 (98)
Space heating efficiency (main heating system 1)	220.9946	220.9946	220.9946	220.9946	220.9946	0.0000	0.0000	0.0000	0.0000	220.9946	220.9946	220.9946 (210)
Space heating fuel (main heating system)	106.3830	69.9938	41.7538	12.4236	1.4486	0.0000	0.0000	0.0000	0.0000	8.5481	51.1086	110.2109 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (64)
Efficiency of water heater (217)m	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939	172.9939 (216)
Fuel for water heating, kWh/month	167.3264	148.0090	157.0234	137.2056	132.4946	118.8059	116.6837	121.5467	123.1628	138.0624	147.7380	165.3589 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (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)

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Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												401.8704	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												172.9939	
Water heating fuel used												1673.4176	(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)												166.8530	(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												2242.1410	(238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	401.8704	26.0600	104.7274	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1673.4176	26.0600	436.0926	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	166.8530	26.0600	43.4819	(250)
Additional standing charges			0.0000	(251)
Total energy cost			584.3019	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	401.8704	0.1586	63.7399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1673.4176	0.1410	235.9760	(264)
Space and water heating			299.7159	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	166.8530	0.1443	24.0820	(268)
Total CO2, kg/year			323.7980	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	401.8704	1.5871	637.8197	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1673.4176	1.5214	2545.9812	(278)
Space and water heating			3183.8009	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	166.8530	1.5338	255.9247	(282)
Total Primary energy kWh/year			3439.7256	(286)

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Property Reference	Ground Floor Apartment				Issued on Date	29/01/2025
Assessment Reference	Be Lean Act		Prop Type Ref			
Property						
SAP Rating	95 A	DER	10.68	TER	11.18	
Environmental	92 A	% DER < TER				4.47
CO ₂ Emissions (t/year)	0.67	DFEE	25.79	TFEE	28.64	
Compliance Check	See BREL	% DFEE < TFEE				9.96
% DPER < TPER	4.98	DPER	55.79	TPER	58.71	
Assessor Details	Mr. James Rivers				Assessor ID	R423-0001
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)
Ground floor	72.9118 (1b)	2.4000 (2b)	174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.9883 (5)

2. Ventilation rate

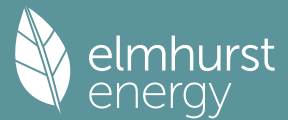
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1143 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3143 (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) = 0.2671 (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	0.3406	0.3339	0.3273	0.2939	0.2872	0.2538	0.2538	0.2471	0.2671	0.2872	0.3005	0.3139 (22b)
Effective ac	0.5580	0.5558	0.5535	0.5432	0.5412	0.5322	0.5322	0.5305	0.5357	0.5412	0.5452	0.5493 (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
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980 (28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619 (29a)
Total net area of external elements Aum(A, m ²)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9307		(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590 (32)
Party Ceiling 1			72.9100			30.0000	2187.3000 (32b)
Internal Wall 1			120.8600			75.0000	9064.5000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	23471.7189 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							321.9194 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.5114	0.0260	0.1693	
E3 Sill				1.4000	0.0230	0.0322	
E4 Jamb				22.5353	0.0180	0.4056	
E5 Ground floor (normal)				23.0370	0.0680	1.5665	
E7 Party floor between dwellings (in blocks of flats)				23.0370	0.0360	0.8293	
E16 Corner (normal)				4.8000	0.0400	0.1920	

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E18 Party wall between dwellings	2.4000	0.0320	0.0768
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672
P1 Party wall - Ground floor	11.3830	0.0580	0.6602
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.9992 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	34.9299 (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	32.2229	32.0928	31.9653	31.3664	31.2544	30.7328	30.7328	30.6362	30.9337	31.2544	31.4811	31.7180 (38)
Heat transfer coeff	67.1528	67.0228	66.8953	66.2964	66.1843	65.6627	65.6627	65.5661	65.8636	66.1843	66.4110	66.6480 (39)
Average = Sum(39)m / 12 =												66.2958
HLP	0.9210	0.9192	0.9175	0.9093	0.9077	0.9006	0.9006	0.8993	0.9033	0.9077	0.9108	0.9141 (40)
HLP (average)												0.9093
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3147 (42)
Hot water usage for mixer showers												86.3334 (42a)
Hot water usage for baths												27.1359 (42b)
Hot water usage for other uses												38.3348 (42c)
Average daily hot water use (litres/day)												139.9970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040 (44)
Energy conte	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885 (45)
Energy content (annual)										Total = Sum(45)m =		2325.3646
Distribution loss (46)m = 0.15 x (45)m												35.6533 (46)
Water storage loss:												150.0000 (47)
Store volume												1.5000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8100 (55)
Enter (49) or (54) in (55)												
Total storage loss												25.1100 (56)
If cylinder contains dedicated solar storage												25.1100 (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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (62)
PV diverter	-24.6523	-21.8027	-22.8306	-18.9046	-17.6184	-15.0762	-14.1315	-15.0275	-15.5984	-18.3888	-20.8323	-24.1958 (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	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2665.8514 (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	118.8611	105.5611	112.9347	100.8059	98.8257	90.2223	89.7311	92.5284	92.7284	102.0283	106.8642	117.7293 (65)

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

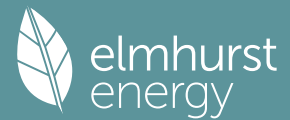
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4444	121.1705	109.4444	113.0925	109.4444	113.0925	109.4444	109.4444	113.0925	109.4444	113.0925	109.4444 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	203.9954	206.1122	200.7779	189.4217	175.0865	161.6135	152.6126	150.4958	155.8302	167.1864	181.5215	194.9946 (68)
Pumps, fans	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735 (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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876 (71)
Total internal gains	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383 (72)
	533.9196	545.0881	522.7366	503.2428	478.0814	457.7351	440.3837	442.0266	455.4325	474.4859	503.7569	523.3976 (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				1.8900	19.6403		0.5000		0.7000		0.7700	9.0035 (76)
South				8.7306	46.7521		0.5000		0.7000		0.7700	99.0025 (78)
Solar gains	108.0060	179.7533	235.5439	275.7361	295.0956	287.1682	279.2529	265.5266	249.4884	195.7828	128.5780	92.9513 (83)
Total gains	641.9256	724.8414	758.2805	778.9789	773.1770	744.9032	719.6366	707.5532	704.9209	670.2686	632.3349	616.3489 (84)

7. Mean internal temperature (heating season)

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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	97.0908	97.2792	97.4646	98.3451	98.5116	99.2941	99.2941	99.4404	98.9912	98.5116	98.1753	97.8263
alpha	7.4727	7.4853	7.4976	7.5563	7.5674	7.6196	7.6196	7.6294	7.5994	7.5674	7.5450	7.5218
util living area	0.9933	0.9827	0.9607	0.8957	0.7624	0.5610	0.4012	0.4259	0.6364	0.8947	0.9811	0.9949 (86)
MIT	20.5084	20.6173	20.7338	20.8615	20.9346	20.9570	20.9590	20.9590	20.9536	20.8763	20.6768	20.4871 (87)
Th 2	20.1497	20.1512	20.1527	20.1596	20.1609	20.1670	20.1670	20.1681	20.1647	20.1609	20.1583	20.1555 (88)
util rest of house	0.9908	0.9765	0.9470	0.8635	0.7057	0.4896	0.3254	0.3491	0.5633	0.8563	0.9732	0.9930 (89)
MIT 2	19.5851	19.7226	19.8664	20.0185	20.0910	20.1136	20.1146	20.1157	20.1093	20.0378	19.8044	19.5632 (90)
Living area fraction	19.9521	20.0782	20.2111	20.3536	20.4263	20.4488	20.4502	20.4509	fLA = Living area / (4) =			0.3975 (91)
MIT	19.9521	20.0782	20.2111	20.3536	20.4263	20.4488	20.4502	20.4509	20.4449	20.3711	20.1512	19.9305 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9521	20.0782	20.2111	20.3536	20.4263	20.4488	20.4502	20.4509	20.4449	20.3711	20.1512	19.9305 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9901	0.9759	0.9481	0.8715	0.7243	0.5140	0.3512	0.3752	0.5882	0.8669	0.9731	0.9923 (94)
Useful gains	635.5555	707.3750	718.9194	678.9083	560.0380	382.8508	252.7584	265.5075	414.6611	581.0288	615.3452	611.6253 (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	1051.0833	1017.2862	917.2098	759.3292	577.5458	384.0497	252.8151	265.6015	417.8979	646.6931	866.7404	1048.4036 (97)
Space heating kWh	309.1527	208.2603	147.5280	57.9030	13.0258	0.0000	0.0000	0.0000	0.0000	48.8543	181.0046	324.9631 (98a)
Space heating requirement - total per year (kWh/year)												1290.6918
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	309.1527	208.2603	147.5280	57.9030	13.0258	0.0000	0.0000	0.0000	0.0000	48.8543	181.0046	324.9631 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1290.6918
Space heating per m2										(98c) / (4) =		17.7021 (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 %)													88.8000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	309.1527	208.2603	147.5280	57.9030	13.0258	0.0000	0.0000	0.0000	0.0000	48.8543	181.0046	324.9631 (98)	
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)	
Space heating fuel (main heating system)	348.1450	234.5274	166.1352	65.2061	14.6687	0.0000	0.0000	0.0000	0.0000	55.0161	203.8340	365.9494 (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	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650 (64)	
Efficiency of water heater (217)m	84.4079	83.7971	82.9285	81.5314	80.2718	79.8000	79.8000	79.8000	79.8000	81.2947	83.4837	79.8000 (216)	
Fuel for water heating, kWh/month	313.7293	279.5369	300.0298	267.9371	263.5910	238.6601	235.2433	244.6629	247.4508	271.1750	281.1870	309.7343 (219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-28.4291	-43.7176	-68.6794	-81.8824	-90.2726	-84.7519	-83.3621	-77.5182	-66.6551	-51.9766	-32.1969	-23.9414 (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)	-13.8547	-33.4951	-79.0292	-137.1801	-196.9150	-203.9509	-198.8731	-158.3663	-103.0330	-51.2764	-19.3054	-10.5142 (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													1453.4817 (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													3252.9375 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													166.8530 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1939.1767 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3020.0956 (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	1453.4817	0.2100	305.2312 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3252.9375	0.2100	683.1169 (264)
Space and water heating			988.3480 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.8530	0.1443	24.0820 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-733.3833	0.1334	-97.8323
PV Unit electricity exported	-1205.7934	0.1225	-147.6872
Total			-245.5194 (269)
Total CO2, kg/year			778.8399 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.6800 (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	1453.4817	1.1300	1642.4344 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3252.9375	1.1300	3675.8194 (278)
Space and water heating			5318.2538 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	166.8530	1.5338	255.9247 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-733.3833	1.4930	-1094.9123
PV Unit electricity exported	-1205.7934	0.4494	-541.9182
Total			-1636.8305 (283)
Total Primary energy kWh/year			4067.4487 (286)
Dwelling Primary energy Rate (DPER)			55.7900 (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)
Ground floor	72.9118 (1b)	2.4000 (2b)	174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.9883 (5)

2. Ventilation rate

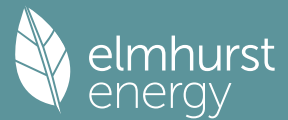
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	0.1714 (8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000 (17)		
Infiltration rate	0.4214 (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) =		0.3582 (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	0.4567	0.4478	0.4388	0.3940	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5741	0.5579	0.5579	0.5549	0.5642	0.5741	0.5812	0.5886 (25)

3. Heat losses and heat loss parameter

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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						
TER Opaque door			2.2360	1.0000	2.2400			(26)					
TER Opening Type (Uw = 1.20)			10.6206	1.1450	12.1603			(27)					
Heat Loss Floor 1			72.9118	0.1300	9.4785			(28a)					
Cavity Wall	55.2889	12.8566	42.4323	0.1800	7.6378			(29a)					
Total net area of external elements Aum(A, m2)			128.2041					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	31.5167			(33)					
Party Wall			27.3191	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							331.9191	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				6.5114	0.0500	0.3256							
E3 Sill				1.4000	0.0500	0.0700							
E4 Jamb				22.5353	0.0500	1.1268							
E5 Ground floor (normal)				23.0370	0.1600	3.6859							
E7 Party floor between dwellings (in blocks of flats)				23.0370	0.0700	1.6126							
E16 Corner (normal)				4.8000	0.0900	0.4320							
E18 Party wall between dwellings				2.4000	0.0600	0.1440							
E25 Staggered party wall between dwellings				2.4000	0.0600	0.1440							
P1 Party wall - Ground floor				11.3830	0.0800	0.9106							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4515	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	39.9681	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.8962	Feb 34.6623	Mar 34.4331	Apr 33.3563	May 33.1548	Jun 32.2169	Jul 32.2169	Aug 32.0433	Sep 32.5782	Oct 33.1548	Nov 33.5624	Dec 33.9885	(38)
Heat transfer coeff	74.8644	74.6305	74.4012	73.3244	73.1229	72.1851	72.1851	72.0114	72.5463	73.1229	73.5305	73.9566	(39)
Average = Sum(39)m / 12 =												73.3234	
HLP	Jan 1.0268	Feb 1.0236	Mar 1.0204	Apr 1.0057	May 1.0029	Jun 0.9900	Jul 0.9900	Aug 0.9877	Sep 0.9950	Oct 1.0029	Nov 1.0085	Dec 1.0143	(40)
HLP (average)												1.0056	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

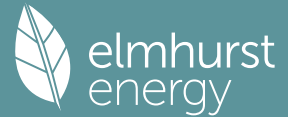
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.3147 (42)
Hot water usage for mixer showers													
63.0294	62.0822	60.7019	58.0610	56.1121	53.9387	52.7033	54.0732	55.5748	57.9083	60.6060	62.7879	62.7879	(42a)
Hot water usage for baths													
27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	27.1359	(42b)
Hot water usage for other uses													
38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	38.3348	(42c)
Average daily hot water use (litres/day)													118.2054 (43)
Daily hot water use	Jan 128.5921	Feb 125.8465	Mar 122.5028	Apr 117.4180	May 113.2889	Jun 108.8497	Jul 107.1435	Aug 110.4728	Sep 113.9840	Oct 118.6444	Nov 123.8076	Dec 128.2586	(44)
Energy conte	203.6585	179.2038	188.2823	160.7394	152.5086	133.8435	129.5808	136.7884	140.5537	160.9993	176.3866	200.8219	(45)
Energy content (annual)										Total = Sum(45)m =		1963.3667	
Distribution loss (46)m = 0.15 x (45)m													
30.5488	26.8806	28.2423	24.1109	22.8763	20.0765	19.4371	20.5183	21.0831	24.1499	26.4580	30.1233	30.1233	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
250.2534	221.2895	234.8772	205.8312	199.1035	178.9353	176.1757	183.3833	185.6455	207.5942	221.4785	247.4168	247.4168	(62)
WWHRS	-28.8144	-25.4837	-26.6851	-22.0963	-20.5930	-17.6215	-16.5174	-17.5646	-18.2319	-21.4934	-24.3494	-28.2808	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.4390	195.8058	208.1921	183.7349	178.5106	161.3138	159.6583	165.8187	167.4136	186.1008	197.1290	219.1360	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2244.2526	(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	104.9924	93.2538	99.8798	89.5193	87.9850	80.5764	80.3615	82.7581	82.8076	90.8082	94.7220	104.0492	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
109.4444	121.1705	109.4444	113.0925	109.4444	113.0925	109.4444	109.4444	109.4444	113.0925	109.4444	113.0925	109.4444	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
203.9954	206.1122	200.7779	189.4217	175.0865	161.6135	152.6126	150.4958	155.8302	167.1864	181.5215	194.9946	194.9946	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	(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)													
-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	(71)
Water heating gains (Table 5)													
141.1188	138.7706	134.2470	124.3324	118.2595	111.9117	108.0128	111.2339	115.0105	122.0540	131.5584	139.8511	139.8511	(72)
Total internal gains	515.2789	526.7737	505.1896	487.5669	463.5107	444.3380	427.7902	428.8945	441.6535	459.4051	486.8928	505.0104	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				1.8900	19.6403	0.6300	0.7000	0.7700	11.3444 (76)			
South				8.7306	46.7521	0.6300	0.7000	0.7700	124.7431 (78)			
Solar gains	136.0875	226.4891	296.7853	347.4275	371.8205	361.8319	351.8587	334.5635	314.3554	246.6863	162.0082	117.1186 (83)
Total gains	651.3664	753.2628	801.9750	834.9944	835.3312	806.1699	779.6488	763.4580	756.0089	706.0914	648.9010	622.1290 (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	89.7951	90.0765	90.3540	91.6809	91.9335	93.1280	93.1280	93.3526	92.6642	91.9335	91.4240	90.8972
alpha	6.9863	7.0051	7.0236	7.1121	7.1289	7.2085	7.2085	7.2235	7.1776	7.1289	7.0949	7.0598
util living area	0.9949	0.9855	0.9648	0.9016	0.7711	0.5686	0.4070	0.4333	0.6501	0.9070	0.9851	0.9962 (86)
MIT	20.2841	20.4538	20.6369	20.8397	20.9571	20.9957	20.9997	20.9995	20.9892	20.8567	20.5436	20.2583 (87)
Th 2	20.0611	20.0637	20.0663	20.0786	20.0809	20.0916	20.0916	20.0936	20.0875	20.0809	20.0763	20.0714 (88)
util rest of house	0.9929	0.9799	0.9515	0.8685	0.7103	0.4902	0.3232	0.3483	0.5699	0.8688	0.9783	0.9947 (89)
MIT 2	19.2476	19.4631	19.6903	19.9340	20.0510	20.0898	20.0916	20.0935	20.0821	19.9587	19.5878	19.2231 (90)
Living area fraction									fLA = Living area / (4) =			0.3975 (91)
MIT	19.6596	19.8568	20.0665	20.2940	20.4112	20.4499	20.4525	20.4536	20.4427	20.3156	19.9677	19.6346 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6596	19.8568	20.0665	20.2940	20.4112	20.4499	20.4525	20.4536	20.4427	20.3156	19.9677	19.6346 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9917	0.9784	0.9515	0.8770	0.7331	0.5214	0.3566	0.3821	0.6018	0.8797	0.9773	0.9937 (94)
Useful gains	645.9826	736.9856	763.0708	732.2649	612.3707	420.3619	277.9873	291.7311	454.9454	621.1172	634.1680	618.2003 (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	1149.8834	1116.2350	1009.3658	835.4578	636.9874	422.2724	278.0933	291.9049	460.1362	710.4367	946.1663	1141.4890 (97)
Space heating kWh	374.9022	254.8556	183.2435	74.2989	18.3148	0.0000	0.0000	0.0000	0.0000	66.4538	224.6388	389.3268 (98a)
Space heating requirement - total per year (kWh/year)												1586.0344
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	374.9022	254.8556	183.2435	74.2989	18.3148	0.0000	0.0000	0.0000	0.0000	66.4538	224.6388	389.3268 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1586.0344
Space heating per m2										(98c) / (4) =		21.7528 (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	374.9022	254.8556	183.2435	74.2989	18.3148	0.0000	0.0000	0.0000	0.0000	66.4538	224.6388	389.3268 (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)	406.1779	276.1166	198.5303	80.4972	19.8427	0.0000	0.0000	0.0000	0.0000	71.9976	243.3790	421.8058 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	221.4390	195.8058	208.1921	183.7349	178.5106	161.3138	159.6583	165.8187	167.4136	186.1008	197.1290	219.1360 (64)
Efficiency of water heater (217)m	85.2306	84.6519	83.7748	82.1988	80.5597	79.8000	79.8000	79.8000	79.8000	81.9864	84.3535	79.8000 (216)
Fuel for water heating, kWh/month	259.8115	231.3071	248.5141	223.5250	221.5878	202.1476	200.0730	207.7928	209.7915	226.9898	233.6940	256.7983 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.7404	18.2432	16.4260	12.0344	9.2957	7.5947	8.4798	11.0224	14.3170	18.7847	21.2173	23.3724 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-24.7753	-36.0371	-53.4226	-62.0087	-68.5439	-64.5904	-63.8065	-59.4177	-51.9405	-42.0843	-27.6320	-21.2927 (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)	-10.8104	-23.0469	-46.3789	-70.4971	-94.0335	-94.7786	-93.6560	-78.9150	-57.3442	-33.2258	-14.5196	-8.5253 (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)												

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(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												1718.3471	(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												2722.0326	(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)												183.5279	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1201.2827	(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												3508.6248	(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	1718.3471	0.2100	360.8529	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2722.0326	0.2100	571.6268	(264)
Space and water heating			932.4797	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	183.5279	0.1443	26.4887	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.5515	0.1339	-77.0845	
PV Unit electricity exported	-625.7312	0.1255	-78.5587	
Total			-155.6432	(269)
Total CO2, kg/year			815.2545	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1718.3471	1.1300	1941.7322	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2722.0326	1.1300	3075.8968	(278)
Space and water heating			5017.6290	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	183.5279	1.5338	281.5011	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.5515	1.4950	-860.4215	
PV Unit electricity exported	-625.7312	0.4608	-288.3542	
Total			-1148.7757	(283)
Total Primary energy kWh/year			4280.4552	(286)
Target Primary Energy Rate (TPER)			58.7100	(287)

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

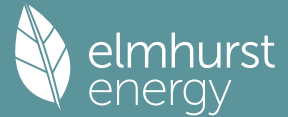
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	72.9118	(1b) x 2.4000 (2b)	= 174.9883	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883	(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)
Infiltation due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	30.0000 / (5) =	0.1714 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltation rate	4.0000	(17)
	0.3714	(18)

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Number of sides sheltered

2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3157 \quad (21)$$

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	0.4025	0.3947	0.3868	0.3473	0.3394	0.2999	0.2999	0.2920	0.3157	0.3394	0.3552	0.3710	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688	(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	
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980	(28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619	(29a)
Total net area of external elements Aum(A, m2)			128.2041					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9307			(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590	(32)
Party Ceiling 1			72.9100			40.0000	2916.4000	(32b)
Internal Wall 1			120.8600			75.0000	9064.5000	(32c)

Heat capacity Cm = Sum(A x k)

$$(28) \dots (30) + (32) + (32a) \dots (32e) = 24200.8189 \quad (34)$$

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

$$331.9191 \quad (35)$$

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.5114	0.0260	0.1693
E2 Other lintels (including other steel lintels)	1.4000	0.0230	0.0322
E3 Sill	22.5353	0.0180	0.4056
E4 Jamb	23.0370	0.0680	1.5665
E5 Ground floor (normal)	23.0370	0.0360	0.8293
E7 Party floor between dwellings (in blocks of flats)	4.8000	0.0400	0.1920
E16 Corner (normal)	2.4000	0.0320	0.0768
E18 Party wall between dwellings	2.4000	0.0280	0.0672
E25 Staggered party wall between dwellings	11.3830	0.0580	0.6602
P1 Party wall - Ground floor			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.9992 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) = 34.9299 (37)

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

(38)m	Jan 33.5518	Feb 33.3701	Mar 33.1920	Apr 32.3556	May 32.1991	Jun 31.4706	Jul 31.4706	Aug 31.3357	Sep 31.7512	Oct 32.1991	Nov 32.5157	Dec 32.8467	(38)
Heat transfer coeff	68.4817	68.3001	68.1220	67.2855	67.1290	66.4005	66.4005	66.2656	66.6811	67.1290	67.4456	67.7766	(39)
Average = Sum(39)m / 12 =	67.2848												(39)

HLP	Jan 0.9392	Feb 0.9367	Mar 0.9343	Apr 0.9228	May 0.9207	Jun 0.9107	Jul 0.9107	Aug 0.9088	Sep 0.9145	Oct 0.9207	Nov 0.9250	Dec 0.9296	(40)
HLP (average)	0.9228												(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3147	(42)	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)	
Hot water usage for baths	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	(42b)	
Hot water usage for other uses	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	(42c)	
Average daily hot water use (litres/day)													60.0944	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.5627	63.7643	61.8009	59.3570	57.1768	54.9110	54.4401	56.3996	58.4093	60.7361	63.2016	65.4706	(44)
Energy conte	103.8353	90.7996	94.9857	81.2567	76.9709	67.5195	65.8406	69.8345	72.0245	82.4183	90.0423	102.5112	(45)
Energy content (annual)	Total = Sum(45)m = 998.0390												
Distribution loss (46)m = 0.15 x (45)m	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)

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 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 0.0000 (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 0.0000 (61)

Total heat required for water heating calculated for each month

88.2600 77.1796 80.7378 69.0682 65.4253 57.3916 55.9645 59.3593 61.2208 70.0555 76.5360 87.1345 (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 88.2600 77.1796 80.7378 69.0682 65.4253 57.3916 55.9645 59.3593 61.2208 70.0555 76.5360 87.1345 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 848.3331 (64)

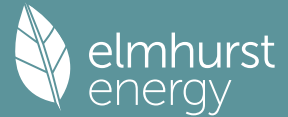
Electric shower(s) 50.4761 44.9746 49.1105 46.8656 47.7450 45.5441 47.0622 47.7450 46.8656 49.1105 48.1871 50.4761 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 574.1623 (64a)

Heat gains from water heating, kWh/month 34.6840 30.5386 32.4621 28.9834 28.2926 25.7339 25.7567 26.7761 27.0216 29.7915 31.1808 34.4026 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4444	121.1705	109.4444	113.0925	109.4444	113.0925	109.4444	109.4444	113.0925	109.4444	113.0925	109.4444	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.9954	206.1122	200.7779	189.4217	175.0865	161.6135	152.6126	150.4958	155.8302	167.1864	181.5215	194.9946	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	(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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	(71)
Water heating gains (Table 5)	46.6183	45.4443	43.6318	40.2548	38.0276	35.7416	34.6192	35.9893	37.5300	40.0424	43.3066	46.2401	(72)
Total internal gains	417.7784	430.4474	411.5744	400.4893	380.2789	368.1679	354.3966	353.6499	364.1730	374.3934	395.6410	408.3994	(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					1.8900	19.6403	0.5000	0.7000			0.7700	9.0035 (76)	
South					8.7306	46.7521	0.5000	0.7000			0.7700	99.0025 (78)	
Solar gains	108.0060	179.7533	235.5439	275.7361	295.0956	287.1682	279.2529	265.5266	249.4884	195.7828	128.5780	92.9513	(83)
Total gains	525.7844	610.2007	647.1184	676.2254	675.3745	655.3360	633.6495	619.1765	613.6614	570.1762	524.2190	501.3507	(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	98.1641	98.4252	98.6825	99.9093	100.1422	101.2409	101.2409	101.4471	100.8149	100.1422	99.6721	99.1854		
alpha	7.5443	7.5617	7.5788	7.6606	7.6761	7.7494	7.7494	7.7631	7.7210	7.6761	7.6448	7.6124		
util living area	0.9985	0.9948	0.9856	0.9489	0.8471	0.6403	0.4605	0.4913	0.7277	0.9532	0.9948	0.9989	(86)	
MIT	20.2548	20.4064	20.5782	20.7917	20.9369	20.9936	20.9995	20.9992	20.9836	20.8132	20.4979	20.2306	(87)	
Th 2	20.1343	20.1364	20.1384	20.1481	20.1500	20.1584	20.1584	20.1600	20.1552	20.1500	20.1463	20.1424	(88)	
util rest of house	0.9978	0.9926	0.9795	0.9278	0.7947	0.5603	0.3728	0.4022	0.6488	0.9295	0.9922	0.9984	(89)	
MIT 2	19.4601	19.6123	19.7826	19.9919	20.1131	20.1561	20.1583	20.1598	20.1484	20.0158	19.7120	19.4429	(90)	
Living area fraction	19.7760	19.9279	20.0988	20.3098	20.4406	20.4890	20.4927	20.4935	20.4804	20.3327	20.0244	19.7560	(91)	
MIT	19.7760	19.9279	20.0988	20.3098	20.4406	20.4890	20.4927	20.4935	20.4804	20.3327	20.0244	19.7560	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.7760	19.9279	20.0988	20.3098	20.4406	20.4890	20.4927	20.4935	20.4804	20.3327	20.0244	19.7560	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	524.4429	605.2943	633.6328	630.5046	549.6459	388.1149	258.3289	271.0044	417.4054	533.3564	519.8829	500.4322	(94)	
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	1059.8223	1026.4098	926.3783	767.7145	586.7448	391.0309	258.4759	271.2561	425.4496	653.3487	871.6917	1054.3327	(97)	
Space heating kWh	398.3223	282.9897	217.8026	98.7911	27.6016	0.0000	0.0000	0.0000	0.0000	89.2743	253.3024	412.1020	(98a)	
Space heating requirement - total per year (kWh/year)												1780.1859		
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	398.3223	282.9897	217.8026	98.7911	27.6016	0.0000	0.0000	0.0000	0.0000	89.2743	253.3024	412.1020	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1780.1859		
Space heating per m2										(98c) / (4) =		24.4156	(99)	

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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		
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	624.1648	491.3638	503.6185	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9382	0.9793	0.9733	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	585.5863	481.2047	490.1507	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	719.6794	696.6426	681.9120	0.0000	0.0000	0.0000	0.0000	(103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	96.5470	160.2858	142.6704	0.0000	0.0000	0.0000	0.0000	(104)	
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)	
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.1362	40.0705	35.6667	0.0000	0.0000	0.0000	0.0000	(107)	
Space cooling requirement												99.8733	(107)	
Energy for space heating												24.4156	(99)	
Energy for space cooling												1.3698	(108)	
Total												25.7854	(109)	
Fabric Energy Efficiency (DFEE)												25.8	(109)	

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (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) =	0.1714 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4214	(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) =	0.3582	(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	0.4567	0.4478	0.4388	0.3940	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5741	0.5579	0.5579	0.5549	0.5642	0.5741	0.5812	0.5886 (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
TER Opaque door			2.2360	1.0000	2.2400		(26)
TER Opening Type (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Heat Loss Floor 1			72.9118	0.1300	9.4785		(28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1800	7.6378		(29a)
Total net area of external elements Aum(A, m ²)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5167		(33)
Party Wall			27.3191	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 331.9191 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	6.5114	0.0500	0.3256
E2 Other lintels (including other steel lintels)	1.4000	0.0500	0.0700
E3 Sill	22.5353	0.0500	1.1268
E4 Jamb	23.0370	0.1600	3.6859
E5 Ground floor (normal)	23.0370	0.0700	1.6126
E7 Party floor between dwellings (in blocks of flats)	4.8000	0.0900	0.4320
E16 Corner (normal)	2.4000	0.0600	0.1440
E18 Party wall between dwellings	2.4000	0.0600	0.1440
E25 Staggered party wall between dwellings	11.3830	0.0800	0.9106
P1 Party wall - Ground floor			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.4515 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	39.9681 (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	34.8962	34.6623	34.4331	33.3563	33.1548	32.2169	32.2169	32.0433	32.5782	33.1548	33.5624	33.9885 (38)
Average = Sum(39)m / 12 =	74.8644	74.6305	74.4012	73.3244	73.1229	72.1851	72.1851	72.0114	72.5463	73.1229	73.5305	73.9566 (39)
												73.3234
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0268	1.0236	1.0204	1.0057	1.0029	0.9900	0.9900	0.9877	0.9950	1.0029	1.0085	1.0143 (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												2.3147 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359 (42b)
Hot water usage for other uses												

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Average daily hot water use (litres/day)	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348 (42c) 60.0944 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	65.5627	63.7643	61.8009	59.3570	57.1768	54.9110	54.4401	56.3996	58.4093	60.7361	63.2016	65.4706 (44)
Energy content (annual)	103.8353	90.7996	94.9857	81.2567	76.9709	67.5195	65.8406	69.8345	72.0245	82.4183	90.0423	102.5112 (45)
Distribution loss (46)m = 0.15 x (45)m	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)
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	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	88.2600	77.1796	80.7378	69.0682	65.4253	57.3916	55.9645	59.3593	61.2208	70.0555	76.5360	87.1345 (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	88.2600	77.1796	80.7378	69.0682	65.4253	57.3916	55.9645	59.3593	61.2208	70.0555	76.5360	87.1345 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				848.3331 (64)
Electric shower(s)	50.4761	44.9746	49.1105	46.8656	47.7450	45.5441	47.0622	47.7450	46.8656	49.1105	48.1871	50.4761 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												574.1623 (64a)
Heat gains from water heating, kWh/month	34.6840	30.5386	32.4621	28.9834	28.2926	25.7339	25.7567	26.7761	27.0216	29.7915	31.1808	34.4026 (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	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345	115.7345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4444	121.1705	109.4444	113.0925	109.4444	113.0925	109.4444	109.4444	113.0925	109.4444	113.0925	109.4444 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.9954	206.1122	200.7779	189.4217	175.0865	161.6135	152.6126	150.4958	155.8302	167.1864	181.5215	194.9946 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735	34.5735 (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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876 (71)
Water heating gains (Table 5)	46.6183	45.4443	43.6318	40.2548	38.0276	35.7416	34.6192	35.9893	37.5300	40.0424	43.3066	46.2401 (72)
Total internal gains	417.7784	430.4474	411.5744	400.4893	380.2789	368.1679	354.3966	353.6499	364.1730	374.3934	395.6410	408.3994 (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						1.8900	19.6403	0.6300	0.7000	0.7700	11.3444	(76)
South						8.7306	46.7521	0.6300	0.7000	0.7700	124.7431	(78)

Solar gains	136.0875	226.4891	296.7853	347.4275	371.8205	361.8319	351.8587	334.5635	314.3554	246.6863	162.0082	117.1186 (83)
Total gains	553.8659	656.9365	708.3598	747.9168	752.0994	729.9997	706.2552	688.2134	678.5284	621.0797	557.6493	525.5180 (84)

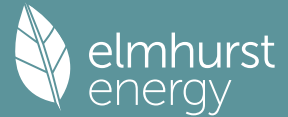
7. Mean internal temperature (heating season)

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	89.7951	90.0765	90.3540	91.6809	91.9335	93.1280	93.1280	93.3526	92.6642	91.9335	91.4240	90.8972
alpha	6.9863	7.0051	7.0236	7.1121	7.1289	7.2085	7.2085	7.2235	7.1776	7.1289	7.0949	7.0598
util living area	0.9981	0.9933	0.9815	0.9379	0.8286	0.6241	0.4489	0.4801	0.7140	0.9464	0.9938	0.9987 (86)
MIT	20.1708	20.3470	20.5435	20.7784	20.9322	20.9923	20.9993	20.9990	20.9807	20.7939	20.4422	20.1452 (87)
Th 2	20.0611	20.0637	20.0663	20.0786	20.0809	20.0916	20.0916	20.0936	20.0875	20.0809	20.0763	20.0714 (88)
util rest of house	0.9973	0.9906	0.9737	0.9130	0.7716	0.5400	0.3567	0.3862	0.6305	0.9195	0.9907	0.9981 (89)
MIT 2	19.3149	19.4917	19.6860	19.9154	20.0421	20.0890	20.0915	20.0934	20.0797	19.9352	19.5974	19.2980 (90)
Living area fraction	19.6551	19.8316	20.0268	20.2584	20.3959	20.4480	20.4524	20.4533	20.4378	20.2765	19.9332	19.6348 (92)
MIT	19.6551	19.8316	20.0268	20.2584	20.3959	20.4480	20.4524	20.4533	20.4378	20.2765	19.9332	19.6348 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6551	19.8316	20.0268	20.2584	20.3959	20.4480	20.4524	20.4533	20.4378	20.2765	19.9332	19.6348 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9968	0.9897	0.9733	0.9185	0.7924	0.5735	0.3935	0.4236	0.6637	0.9262	0.9901	0.9977 (94)
Ext temp.	552.1135	650.1833	689.4246	686.9457	595.9869	418.6674	277.8789	291.5444	450.3195	575.2183	552.1088	524.3291 (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	1149.5513	1114.3550	1006.4110	832.8510	635.8692	422.1404	278.0826	291.8873	459.7867	707.5742	943.6297	1141.5023 (97)
Space heating requirement - total per year (kWh/year)	444.4938	311.9233	235.8379	105.0518	29.6724	0.0000	0.0000	0.0000	0.0000	98.4727	281.8950	459.1768 (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)

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Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh
444.4938 311.9233 235.8379 105.0518 29.6724 0.0000 0.0000 0.0000 0.0000 98.4727 281.8950 459.1768 (98c)
Space heating requirement after solar contribution - total per year (kWh/year) 1966.5239
Space heating per m2 (98c) / (4) = 26.9713 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	678.5398	534.1697	547.2867	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9399	0.9787	0.9725	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	637.7519	522.7843	532.2365	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh						806.9486	781.5065	762.6045	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	121.8216	192.4893	171.3938	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)									fc = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	30.4547	48.1211	42.8474	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												121.4232 (107)
Energy for space cooling												26.9713 (99)
Total												1.6653 (108)
Fabric Energy Efficiency (TFEE)												28.6366 (109)
												28.6 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		174.9883 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1143 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3143 (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) = 0.2671 (21)

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
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980 (28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619 (29a)
Total net area of external elements Aum(A, m2)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9307		(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590 (32)
Party Ceiling 1			72.9100			40.0000	2916.4000 (32b)
Internal Wall 1			120.8600			75.0000	9064.5000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 24200.8189 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							331.9191 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.5114	0.0260	0.1693
E2 Other lintels (including other steel lintels)	1.4000	0.0230	0.0322
E3 Sill	22.5353	0.0180	0.4056
E4 Jamb	23.0370	0.0680	1.5665
E5 Ground floor (normal)	23.0370	0.0360	0.8293
E7 Party floor between dwellings (in blocks of flats)	4.8000	0.0400	0.1920
E16 Corner (normal)	2.4000	0.0320	0.0768
E18 Party wall between dwellings	2.4000	0.0280	0.0672
E25 Staggered party wall between dwellings	11.3830	0.0580	0.6602
P1 Party wall - Ground floor			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.9992 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	34.9299 (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	32.2229	32.0928	31.9653	31.3664	31.2544	30.7328	30.7328	30.6362	30.9337	31.2544	31.4811	31.7180	(38)
Heat transfer coeff	67.1528	67.0228	66.8953	66.2964	66.1843	65.6627	65.6627	65.5661	65.8636	66.1843	66.4110	66.6480	(39)
Average = Sum(39)m / 12 =												66.2958	
HLP	0.9210	0.9192	0.9175	0.9093	0.9077	0.9006	0.9006	0.8993	0.9033	0.9077	0.9108	0.9141	(40)
HLP (average)												0.9093	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3147 (42)
Hot water usage for mixer showers	86.6655	85.3630	83.4652	79.8339	77.1542	74.1657	72.4671	74.3506	76.4153	79.6240	83.3332	86.3334	(42a)
Hot water usage for baths	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	(42b)
Hot water usage for other uses	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	(42c)
Average daily hot water use (litres/day)												139.9970	(43)
Daily hot water use	152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040	(44)
Energy conte	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885	(45)
Energy content (annual)										Total = Sum(45)m =		2325.3646	
Distribution loss (46)m = 0.15 x (45)m	36.1638	31.8533	33.4903	28.5818	27.1253	23.8072	23.0225	24.2844	24.9378	28.5701	31.3149	35.6533	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609	(62)
WWHRS	-24.6523	-21.8027	-22.8306	-18.9046	-17.6184	-15.0762	-14.1315	-15.0275	-15.5984	-18.3888	-20.8323	-24.1958	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650	(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	118.8611	105.5611	112.9347	100.8059	98.8257	90.2223	89.7311	92.5284	92.7284	102.0283	106.8642	117.7293	(65)

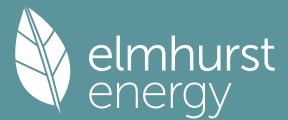
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.6198	20.9789	17.0612	12.9164	9.6552	8.1513	8.8078	11.4487	15.3664	19.5111	22.7724	24.2762	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	304.4707	307.6302	299.6685	282.7189	261.3231	241.2141	227.7801	224.6206	232.5823	249.5319	270.9277	291.0367	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	(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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	(71)
Water heating gains (Table 5)	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383	(72)
Total internal gains	588.3467	586.1907	569.0203	536.1402	504.3051	472.1708	454.6908	457.9320	474.2349	506.6745	542.6192	574.0479	(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				1.8900	19.6403		0.5000		0.7000		0.7700		9.0035 (76)
South				8.7306	46.7521		0.5000		0.7000		0.7700		99.0025 (78)
Solar gains	108.0060	179.7533	235.5439	275.7361	295.0956	287.1682	279.2529	265.5266	249.4884	195.7828	128.5780		92.9513 (83)

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Total gains 696.3526 765.9440 804.5642 811.8763 799.4008 759.3390 733.9437 723.4586 723.7232 702.4572 671.1972 666.9992 (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	100.1067	100.3010	100.4922	101.4000	101.5716	102.3785	102.3785	102.5293	102.0662	101.5716	101.2249	100.8650
alpha	7.6738	7.6867	7.6995	7.7600	7.7714	7.8252	7.8252	7.8353	7.8044	7.7714	7.7483	7.7243
util living area	0.9901	0.9781	0.9497	0.8805	0.7441	0.5510	0.3935	0.4166	0.6217	0.8768	0.9754	0.9925 (86)
MIT	20.5681	20.6606	20.7730	20.8806	20.9412	20.9586	20.9601	20.9601	20.9560	20.8942	20.7163	20.5447 (87)
Th 2	20.1497	20.1512	20.1527	20.1596	20.1609	20.1670	20.1670	20.1681	20.1647	20.1609	20.1583	20.1555 (88)
util rest of house	0.9863	0.9703	0.9328	0.8453	0.6867	0.4806	0.3191	0.3415	0.5495	0.8347	0.9653	0.9897 (89)
MIT 2	19.6588	19.7749	19.9115	20.0381	20.0967	20.1152	20.1159	20.1171	20.1115	20.0554	19.8514	19.6346 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.0202	20.1269	20.2539	20.3730	20.4324	20.4504	20.4515	20.4522	20.4471	20.3888	20.1952	19.9963 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0202	20.1269	20.2539	20.3730	20.4324	20.4504	20.4515	20.4522	20.4471	20.3888	20.1952	19.9963 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9856	0.9700	0.9351	0.8549	0.7059	0.5047	0.3445	0.3672	0.5742	0.8471	0.9658	0.9890 (94)
Useful gains	686.3507	743.0011	752.3569	694.0970	564.2811	383.2357	252.8588	265.6202	415.5895	595.0302	648.2338	659.6674 (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	1055.6590	1020.5504	920.0720	760.6170	577.9455	384.1554	252.8985	265.6858	418.0455	647.8673	869.6650	1052.7939 (97)
Space heating kWh	274.7654	186.5131	124.7800	47.8944	10.1663	0.0000	0.0000	0.0000	0.0000	39.3109	159.4304	292.4862 (98a)
Space heating requirement - total per year (kWh/year)												1135.3467
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	274.7654	186.5131	124.7800	47.8944	10.1663	0.0000	0.0000	0.0000	0.0000	39.3109	159.4304	292.4862 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1135.3467
Space heating per m2												(98c) / (4) = 15.5715 (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 %)												88.8000 (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	274.7654	186.5131	124.7800	47.8944	10.1663	0.0000	0.0000	0.0000	0.0000	39.3109	159.4304	292.4862 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	309.4205	210.0373	140.5180	53.9351	11.4485	0.0000	0.0000	0.0000	0.0000	44.2690	179.5388	329.3763 (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	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650 (64)
Efficiency of water heater	84.1426	83.5538	82.5960	81.2813	80.1725	79.8000	79.8000	79.8000	79.8000	81.0430	83.2111	79.8000 (216)
Fuel for water heating, kWh/month	314.7182	280.3509	301.2378	268.7612	263.9175	238.6601	235.2433	244.6629	247.4508	272.0170	282.1084	310.6038 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-28.4291	-43.7176	-68.6794	-81.8824	-90.2726	-84.7519	-83.3621	-77.5182	-66.6551	-51.9766	-32.1969	-23.9414 (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	-13.8547	-33.4951	-79.0292	-137.1801	-196.9150	-203.9509	-198.8731	-158.3663	-103.0330	-51.2764	-19.3054	-10.5142 (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												1278.5435 (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												3259.7318 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)

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Electricity for lighting (calculated in Appendix L)	166.8530 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1939.1767 (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	2851.9517 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1278.5435	3.6400	46.5390 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3259.7318	3.6400	118.6542 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	166.8530	16.4900	27.5141 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-733.3833	16.4900	-120.9349
PV Unit electricity exported	-1205.7934	5.5900	-67.4038
Total			-188.3388 (252)
Total energy cost			110.5499 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3375 (257)
SAP value		94.5287
SAP rating (Section 12)		95 (258)
SAP band		A

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	1278.5435	0.2100	268.4941 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3259.7318	0.2100	684.5437 (264)
Space and water heating			953.0378 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.8530	0.1443	24.0820 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-733.3833	0.1334	-97.8323
PV Unit electricity exported	-1205.7934	0.1225	-147.6872
Total			-245.5194 (269)
Total CO2, kg/year			743.5297 (272)
CO2 emissions per m2			10.2000 (273)
EI value			91.5502
EI rating			92 (274)
EI band			A

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

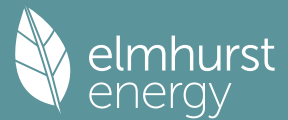
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.9883 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) = 0.1143 (8)

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Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.3143 (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) =	0.2671 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500
Effective ac	0.2805	0.2671	0.2671	0.2471	0.2471	0.2204	0.2271	0.2137	0.2204	0.2338	0.2338	0.2538
	0.5393	0.5357	0.5357	0.5305	0.5305	0.5243	0.5258	0.5228	0.5243	0.5273	0.5273	0.5322

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
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603		(27)
Door 1.2			2.2360	1.2000	2.6880		(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980 (28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619 (29a)
Total net area of external elements Aum(A, m2)			128.2041				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9307		(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590 (32)
Party Ceiling 1			72.9100			40.0000	2916.4000 (32b)
Internal Wall 1			120.8600			75.0000	9064.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24200.8189 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 331.9191 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.5114	0.0260	0.1693
E3 Sill	1.4000	0.0230	0.0322
E4 Jamb	22.5353	0.0180	0.4056
E5 Ground floor (normal)	23.0370	0.0680	1.5665
E7 Party floor between dwellings (in blocks of flats)	23.0370	0.0360	0.8293
E16 Corner (normal)	4.8000	0.0400	0.1920
E18 Party wall between dwellings	2.4000	0.0320	0.0768
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672
P1 Party wall - Ground floor	11.3830	0.0580	0.6602

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.9992 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.9299 (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	31.1449	30.9337	30.9337	30.6362	30.6362	30.2756	30.3619	30.1919	30.2756	30.4507	30.4507	30.7328
Average = Sum(39)m / 12 =	66.0749	65.8636	65.8636	65.5661	65.5661	65.2055	65.2918	65.1218	65.2055	65.3807	65.3807	65.6627
												65.5153

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9062	0.9033	0.9033	0.8993	0.8993	0.8943	0.8955	0.8932	0.8943	0.8967	0.8967	0.9006
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3147 (42)
Hot water usage for mixer showers												
86.6655	85.3630	83.4652	79.8339	77.1542	74.1657	72.4671	74.3506	76.4153	79.6240	83.3332	86.3334	(42a)
Hot water usage for baths												
27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	(42b)
Hot water usage for other uses												
38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	(42c)
Average daily hot water use (litres/day)												139.9970 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040	151.8040 (44)
Energy conte	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885 (45)
Energy content (annual)										Total = Sum(45)m =		2325.3646
Distribution loss (46)m = 0.15 x (45)m												
36.1638	31.8533	33.4903	28.5818	27.1253	23.8072	23.0225	24.2844	24.9378	28.5701	31.3149	35.6533	35.6533 (46)

Water storage loss: 150.0000 (47)

Store volume 1.5000 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.8100 (55)

Enter (49) or (54) in (55)												
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (62)
WWHRS	-24.6523	-21.8027	-22.8306	-18.9046	-17.6184	-15.0762	-14.1315	-15.0275	-15.5984	-18.3888	-20.8323	-24.1958 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h 264.8122 234.2439 248.8104 218.4528 211.5893 190.4507 187.7242 195.2410 197.4657 220.4508 234.7454 261.8650 (64)

Total per year (kWh/year) = Sum(64)m = 2665.8514 (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 118.8611 105.5611 112.9347 100.8059 98.8257 90.2223 89.7311 92.5284 92.7284 102.0283 106.8642 117.7293 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.6198	20.9789	17.0612	12.9164	9.6552	8.1513	8.8078	11.4487	15.3664	19.5111	22.7724	24.2762 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	304.4707	307.6302	299.6685	282.7189	261.3231	241.2141	227.7801	224.6206	232.5823	249.5319	270.9277	291.0367 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028 (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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876 (71)
Water heating gains (Table 5)	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383 (72)
Total internal gains	588.3467	586.1907	569.0203	536.1402	504.3051	472.1708	454.6908	457.9320	474.2349	506.6745	542.6192	574.0479 (73)

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East						1.8900	22.3313	0.5000	0.7000	0.7700	10.2371	(76)	
South						8.7306	50.9848	0.5000	0.7000	0.7700	107.9658	(78)	
Solar gains	118.2029	176.6990	228.5998	276.8333	290.4073	303.4820	291.4757	281.8234	262.7023	205.3717	144.0748	100.8090	(83)
Total gains	706.5496	762.8898	797.6200	812.9735	794.7124	775.6528	746.1665	739.7554	736.9372	712.0461	686.6940	674.8570	(84)

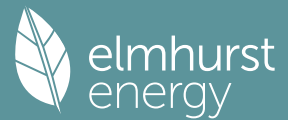
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	101.7399	102.0662	102.0662	102.5293	102.5293	103.0963	102.9601	103.2288	103.0963	102.8201	102.8201	102.3785
alpha	7.7827	7.8044	7.8044	7.8353	7.8353	7.8731	7.8640	7.8819	7.8731	7.8547	7.8547	7.8252
util living area	0.9846	0.9708	0.9308	0.8321	0.6511	0.4201	0.2713	0.2817	0.5119	0.8121	0.9576	0.9881 (86)
MIT	20.6378	20.7115	20.8209	20.9136	20.9539	20.9603	20.9604	20.9605	20.9596	20.9273	20.7855	20.6175 (87)
Th 2	20.1622	20.1647	20.1647	20.1681	20.1681	20.1723	20.1713	20.1733	20.1723	20.1703	20.1703	20.1670 (88)
util rest of house	0.9788	0.9605	0.9083	0.7881	0.5874	0.3507	0.1987	0.2089	0.4396	0.7579	0.9409	0.9835 (89)
MIT 2	19.7571	19.8495	19.9780	20.0792	20.1135	20.1216	20.1205	20.1226	20.1213	20.0954	19.9449	19.7363 (90)
Living area fraction	20.1072	20.1921	20.3130	20.4109	20.4475	20.4549	20.4544	20.4557	fLA = Living area / (4) =			0.3975 (91)
MIT	20.1072	20.1921	20.3130	20.4109	20.4475	20.4549	20.4544	20.4557	20.4545	20.4260	20.2790	20.0866 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1072	20.1921	20.3130	20.4109	20.4475	20.4549	20.4544	20.4557	20.4545	20.4260	20.2790	20.0866 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9783	0.9609	0.9127	0.8016	0.6092	0.3744	0.2235	0.2338	0.4643	0.7755	0.9434	0.9830 (94)
Useful gains	691.2425	733.0411	728.0183	651.6966	484.1027	290.4059	166.7783	172.9404	342.1796	552.2025	647.8373	663.3639 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	991.5972	961.0905	850.4994	689.1562	488.3039	290.4855	166.7793	172.9418	342.6212	577.0525	802.8120	984.0595 (97)
Space heating kWh	223.4639	153.2492	91.1259	26.9709	3.1257	0.0000	0.0000	0.0000	0.0000	18.4885	111.5817	238.5975 (98a)
Space heating requirement - total per year (kWh/year)												866.6034
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	223.4639	153.2492	91.1259	26.9709	3.1257	0.0000	0.0000	0.0000	0.0000	18.4885	111.5817	238.5975 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.6034
Space heating per m2												11.8856 (99)
										(98c) / (4) =		

[illegible]

Water heating
Water heating requirement

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Efficiency of water heater (217)m	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650 (64)
Fuel for water heating, kWh/month	83.6815	83.1322	82.0286	80.6988	79.9179	79.8000	79.8000	79.8000	79.8000	80.4308	82.4937	79.8000 (216)
Space cooling fuel requirement (221)m	316.4525	281.7727	303.3213	270.7013	264.7582	238.6601	235.2433	244.6629	247.4508	274.0877	284.5615	83.8517 (217)
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	312.2955 (219)
Lighting	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	0.0000 (221)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	7.0685 (231)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-31.6565	-44.6769	-69.3808	-83.6455	-90.7944	-87.2513	-85.5328	-80.6604	-70.0063	-55.2665	-36.3134	21.2488 (232)
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 (233a)
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 (234a)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-16.7935	-34.9430	-80.8211	-145.1203	-200.4943	-225.6847	-217.2683	-178.7898	-116.7933	-58.3695	-24.1526	0.0000 (235a)
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 (235c)
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 (233b)
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 (234b)
Annual totals kWh/year												0.0000 (235b)
Space heating fuel - main system 1												0.0000 (235d)
Space heating fuel - main system 2												975.9047 (211)
Space heating fuel - secondary												0.0000 (213)
Efficiency of water heater												0.0000 (215)
Water heating fuel used												79.8000
Space cooling fuel												3273.9678 (219)
Electricity for pumps and fans:												0.0000 (221)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												166.8530 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2073.5052 (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												2429.2202 (238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	975.9047	5.6000	54.6507 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3273.9678	5.6000	183.3422 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	166.8530	26.0600	43.4819 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-761.6958	26.0600	-198.4979
PV Unit electricity exported	-1311.8095	5.8100	-76.2161
Total			-274.7140 (252)
Total energy cost			128.1723 (255)

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	975.9047	0.2100	204.9400 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3273.9678	0.2100	687.5332 (264)
Space and water heating			892.4732 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.8530	0.1443	24.0820 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-761.6958	0.1336	-101.7296
PV Unit electricity exported	-1311.8095	0.1221	-160.1424
Total			-261.8720 (269)
Total CO2, kg/year			666.6125 (272)

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	975.9047	1.1300	1102.7723 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3273.9678	1.1300	3699.5836 (278)
Space and water heating			4802.3559 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	166.8530	1.5338	255.9247 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-761.6958	1.4935	-1137.6253
PV Unit electricity exported	-1311.8095	0.4479	-587.4987
Total			-1725.1240 (283)
Total Primary energy kWh/year			3463.2574 (286)

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SAP 10 EPC IMPROVEMENTS

Be Lean Act

Current energy efficiency rating: A 95
Current environmental impact rating: A 92

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

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

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

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 560 TEST (06 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£66	£66	£0
Mains gas	£337	£337	£0
Space heating	£176	£176	£0
Water heating	£183	£183	£0
Lighting	£43	£43	£0
Generated (PV)	-£275	-£275	£0
Total cost of fuels	£128	£128	£0
Total cost of uses	£127	£127	£0
Delivered energy	33 kWh/m ²	33 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m ²	9 kg/m ²	9 kg/m ²	0 kg/m ²
Primary energy	47 kWh/m ²	47 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.9118 (1b)	x 2.4000 (2b)	= 174.9883 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9883 (5)

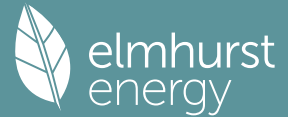
2. Ventilation rate

	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	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1143 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000 (17)	
Infiltration rate	0.3143 (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) =	0.2671 (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	0.3406	0.3339	0.3273	0.2939	0.2872	0.2538	0.2538	0.2471	0.2671	0.2872	0.3005	0.3139 (22b)
Effective ac	0.5580	0.5558	0.5535	0.5432	0.5412	0.5322	0.5322	0.5305	0.5357	0.5412	0.5452	0.5493 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603			(27)
Door 1.2			2.2360	1.2000	2.6880			(26)
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980	(28a)
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619	(29a)
Total net area of external elements Aum(A, m2)			128.2041					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9307			(33)
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590	(32)
Party Ceiling 1			72.9100			40.0000	2916.4000	(32b)
Internal Wall 1			120.8600			75.0000	9064.5000	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 24200.8189 (34)
List of Thermal Bridges
331.9191 (35)

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	6.5114	0.0260	0.1693	
E3 Sill	1.4000	0.0230	0.0322	
E4 Jamb	22.5353	0.0180	0.4056	
E5 Ground floor (normal)	23.0370	0.0680	1.5665	
E7 Party floor between dwellings (in blocks of flats)	23.0370	0.0360	0.8293	
E16 Corner (normal)	4.8000	0.0400	0.1920	
E18 Party wall between dwellings	2.4000	0.0320	0.0768	
E25 Staggered party wall between dwellings	2.4000	0.0280	0.0672	
P1 Party wall - Ground floor	11.3830	0.0580	0.6602	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				3.9992 (36)
Point Thermal Bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	34.9299 (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	32.2229	32.0928	31.9653	31.3664	31.2544	30.7328	30.7328	30.6362	30.9337	31.2544	31.4811	31.7180	(38)
Average = Sum(39)m / 12 =	67.1528	67.0228	66.8953	66.2964	66.1843	65.6627	65.6627	65.5661	65.8636	66.1843	66.4110	66.6480	(39)
													66.2958
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9210	0.9192	0.9175	0.9093	0.9077	0.9006	0.9006	0.8993	0.9033	0.9077	0.9108	0.9141	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
													0.9093
													31

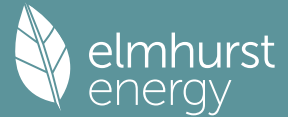
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3147 (42)
Hot water usage for mixer showers	86.6655	85.3630	83.4652	79.8339	77.1542	74.1657	72.4671	74.3506	76.4153	79.6240	83.3332	86.3334	(42a)
Hot water usage for baths	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359	(42b)
Hot water usage for other uses	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348	(42c)
Average daily hot water use (litres/day)													139.9970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040	(44)
Energy content (annual)	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885	(45)
Distribution loss (46)m = 0.15 x (45)m	36.1638	31.8533	33.4903	28.5818	27.1253	23.8072	23.0225	24.2844	24.9378	28.5701	31.3149	35.6533	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8100 (55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609	(62)
WWHRS	-24.6523	-21.8027	-22.8306	-18.9046	-17.6184	-15.0762	-14.1315	-15.0275	-15.5984	-18.3888	-20.8323	-24.1958	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650	(64)
Total per year (kWh/year) = Sum(64)m =													2665.8514 (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) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	118.8611	105.5611	112.9347	100.8059	98.8257	90.2223	89.7311	92.5284	92.7284	102.0283	106.8642	117.7293	(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	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	23.6198	20.9789	17.0612	12.9164	9.6552	8.1513	8.8078	11.4487	15.3664	19.5111	22.7724	24.2762	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	304.4707	307.6302	299.6685	282.7189	261.3231	241.2141	227.7801	224.6206	232.5823	249.5319	270.9277	291.0367	(68)
Pumps, fans	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	(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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	(71)

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Total internal gains	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383 (72)
	588.3467	586.1907	569.0203	536.1402	504.3051	472.1708	454.6908	457.9320	474.2349	506.6745	542.6192	574.0479 (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				1.8900	19.6403	0.5000	0.7000	0.7700	9.0035 (76)			
South				8.7306	46.7521	0.5000	0.7000	0.7700	99.0025 (78)			
Solar gains	108.0060	179.7533	235.5439	275.7361	295.0956	287.1682	279.2529	265.5266	249.4884	195.7828	128.5780	92.9513 (83)
Total gains	696.3526	765.9440	804.5642	811.8763	799.4008	759.3390	733.9437	723.4586	723.7232	702.4572	671.1972	666.9992 (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	100.1067	100.3010	100.4922	101.4000	101.5716	102.3785	102.3785	102.5293	102.0662	101.5716	101.2249	100.8650
alpha	7.6738	7.6867	7.6995	7.7600	7.7714	7.8252	7.8252	7.8353	7.8044	7.7714	7.7483	7.7243
util living area	0.9901	0.9781	0.9497	0.8805	0.7441	0.5510	0.3935	0.4166	0.6217	0.8768	0.9754	0.9925 (86)
MIT	20.5681	20.6606	20.7730	20.8806	20.9412	20.9586	20.9601	20.9601	20.9560	20.8942	20.7163	20.5447 (87)
Th 2	20.1497	20.1512	20.1527	20.1596	20.1609	20.1670	20.1670	20.1681	20.1647	20.1609	20.1583	20.1555 (88)
util rest of house	0.9863	0.9703	0.9328	0.8453	0.6867	0.4806	0.3191	0.3415	0.5495	0.8347	0.9653	0.9897 (89)
MIT 2	19.6588	19.7749	19.9115	20.0381	20.0967	20.1152	20.1159	20.1171	20.1115	20.0554	19.8514	19.6346 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.0202	20.1269	20.2539	20.3730	20.4324	20.4504	20.4515	20.4522	20.4471	20.3888	20.1952	19.9963 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0202	20.1269	20.2539	20.3730	20.4324	20.4504	20.4515	20.4522	20.4471	20.3888	20.1952	19.9963 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9856	0.9700	0.9351	0.8549	0.7059	0.5047	0.3445	0.3672	0.5742	0.8471	0.9658	0.9890 (94)
Useful gains	686.3507	743.0011	752.3569	694.0970	564.2811	383.2357	252.8588	265.6202	415.5895	595.0302	648.2338	659.6674 (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	1055.6590	1020.5504	920.0720	760.6170	577.9455	384.1554	252.8985	265.6858	418.0455	647.8673	869.6650	1052.7939 (97)
Space heating kWh	274.7654	186.5131	124.7800	47.8944	10.1663	0.0000	0.0000	0.0000	0.0000	39.3109	159.4304	292.4862 (98a)
Space heating requirement - total per year (kWh/year)												1135.3467
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	274.7654	186.5131	124.7800	47.8944	10.1663	0.0000	0.0000	0.0000	0.0000	39.3109	159.4304	292.4862 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1135.3467
Space heating per m2												(98c) / (4) = 15.5715 (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 %)												88.8000 (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	274.7654	186.5131	124.7800	47.8944	10.1663	0.0000	0.0000	0.0000	0.0000	39.3109	159.4304	292.4862 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	309.4205	210.0373	140.5180	53.9351	11.4485	0.0000	0.0000	0.0000	0.0000	44.2690	179.5388	329.3763 (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	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650 (64)
Efficiency of water heater	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000	79.8000 (216)
(217)m	84.1426	83.5538	82.5960	81.2813	80.1725	79.8000	79.8000	79.8000	79.8000	81.0430	83.2111	84.3084 (217)
Fuel for water heating, kWh/month	314.7182	280.3509	301.2378	268.7612	263.9175	238.6601	235.2433	244.6629	247.4508	272.0170	282.1084	310.6038 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-28.4291	-43.7176	-68.6794	-81.8824	-90.2726	-84.7519	-83.3621	-77.5182	-66.6551	-51.9766	-32.1969	-23.9414 (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)												

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(233b)m	-13.8547	-33.4951	-79.0292	-137.1801	-196.9150	-203.9509	-198.8731	-158.3663	-103.0330	-51.2764	-19.3054	-10.5142	(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												1278.5435	(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												3259.7318	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												166.8530	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1939.1767	(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												2851.9517	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1278.5435	3.6400	46.5390	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3259.7318	3.6400	118.6542	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	166.8530	16.4900	27.5141	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-733.3833	16.4900	-120.9349	
PV Unit electricity exported	-1205.7934	5.5900	-67.4038	
Total			-188.3388	(252)
Total energy cost			110.5499	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.3375	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	94.5287	
SAP rating (Section 12)		95	(258)
SAP band		A	

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

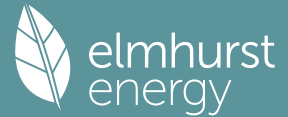
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1278.5435	0.2100	268.4941	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3259.7318	0.2100	684.5437	(264)
Space and water heating			953.0378	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.8530	0.1443	24.0820	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-733.3833	0.1334	-97.8323	
PV Unit electricity exported	-1205.7934	0.1225	-147.6872	
Total			-245.5194	(269)
Total CO2, kg/year			743.5297	(272)
CO2 emissions per m2			10.2000	(273)
EI value			91.5502	
EI rating			92	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	72.9118	(1b) x 2.4000	(2b) =	174.9883
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.9118			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.9883
				(5)

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2. Ventilation rate

												m3 per hour	
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												2 * 10 =	20.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												20.0000 / (5) =	0.1143 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												4.0000 (17)	
Infiltration rate												0.3143 (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) = 0.2671 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.2805	0.2671	0.2671	0.2471	0.2471	0.2204	0.2271	0.2137	0.2204	0.2338	0.2338	0.2538	(22b)
Effective ac	0.5393	0.5357	0.5357	0.5305	0.5305	0.5243	0.5258	0.5228	0.5243	0.5273	0.5273	0.5322	(25)

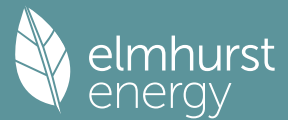
3. Heat losses and heat loss parameter

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						
Window 1.2 (Uw = 1.20)			10.6206	1.1450	12.1603			(27)					
Door 1.2			2.2360	1.2000	2.6880			(26)					
Heat Loss Floor 1			72.9118	0.1100	8.0203	110.0000	8020.2980	(28a)					
Cavity Wall	55.2889	12.8566	42.4323	0.1900	8.0621	70.0000	2970.2619	(29a)					
Total net area of external elements Aum(A, m2)			128.2041					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9307			(33)					
Party Wall			27.3191	0.0000	0.0000	45.0000	1229.3590	(32)					
Party Ceiling 1			72.9100			40.0000	2916.4000	(32b)					
Internal Wall 1			120.8600			75.0000	9064.5000	(32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	24200.8189	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							331.9191	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				6.5114	0.0260	0.1693							
E3 Sill				1.4000	0.0230	0.0322							
E4 Jamb				22.5353	0.0180	0.4056							
E5 Ground floor (normal)				23.0370	0.0680	1.5665							
E7 Party floor between dwellings (in blocks of flats)				23.0370	0.0360	0.8293							
E16 Corner (normal)				4.8000	0.0400	0.1920							
E18 Party wall between dwellings				2.4000	0.0320	0.0768							
E25 Staggered party wall between dwellings				2.4000	0.0280	0.0672							
P1 Party wall - Ground floor				11.3830	0.0580	0.6602							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.9992	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	34.9299 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.1449	30.9337	30.9337	30.6362	30.6362	30.2756	30.3619	30.1919	30.2756	30.4507	30.4507	30.7328	(38)
Heat transfer coeff	66.0749	65.8636	65.8636	65.5661	65.5661	65.2055	65.2918	65.1218	65.2055	65.3807	65.3807	65.6627	(39)
Average = Sum(39)m / 12 =												65.5153	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9062	0.9033	0.9033	0.8993	0.8993	0.8943	0.8955	0.8932	0.8943	0.8967	0.8967	0.9006	(40)
HLP (average)												0.8986	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3147											
Hot water usage for mixer showers	86.6655	85.3630	83.4652	79.8339	77.1542	74.1657	72.4671	74.3506	76.4153	79.6240	83.3332	86.3334
Hot water usage for baths	27.2279	26.8236	26.2541	25.2042	24.4180	23.5462	23.0753	23.6408	24.2565	25.1893	26.2609	27.1359
Hot water usage for other uses	38.3348	36.9408	35.5468	34.1528	32.7588	31.3648	31.3648	32.7588	34.1528	35.5468	36.9408	38.3348
Average daily hot water use (litres/day)												139.9970
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	152.2281	149.1274	145.2661	139.1909	134.3309	129.0768	126.9072	130.7502	134.8245	140.3600	146.5348	151.8040
Energy content (annual)	241.0922	212.3554	223.2685	190.5454	180.8353	158.7149	153.4833	161.8961	166.2522	190.4672	208.7657	237.6885
Distribution loss (46)m = 0.15 x (45)m	36.1638	31.8533	33.4903	28.5818	27.1253	23.8072	23.0225	24.2844	24.9378	28.5701	31.3149	35.6533
Water storage loss:												
Store volume												150.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.5000
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												0.8100
Total storage loss												
	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100

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If cylinder contains dedicated solar storage												
Primary loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100 (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	289.4646	256.0466	271.6409	237.3574	229.2077	205.5269	201.8557	210.2685	213.0642	238.8396	255.5777	286.0609 (62)
PV diverter	-24.6523	-21.8027	-22.8306	-18.9046	-17.6184	-15.0762	-14.1315	-15.0275	-15.5984	-18.3888	-20.8323	-24.1958 (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)
Electric shower(s)	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650 (64)
Total per year (kWh/year) = Sum(64a)m =												2665.8514 (64)
Heat gains from water heating, kWh/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 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	118.8611	105.5611	112.9347	100.8059	98.8257	90.2223	89.7311	92.5284	92.7284	102.0283	106.8642	117.7293 (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	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	138.8815	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.6198	20.9789	17.0612	12.9164	9.6552	8.1513	8.8078	11.4487	15.3664	19.5111	22.7724	24.2762	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	304.4707	307.6302	299.6685	282.7189	261.3231	241.2141	227.7801	224.6206	232.5823	249.5319	270.9277	291.0367	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	51.2028	(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)	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	-92.5876	(71)
Water heating gains (Table 5)	159.7595	157.0850	151.7940	140.0082	132.8302	125.3088	120.6063	124.3661	128.7895	137.1348	148.4225	158.2383	(72)
Total internal gains	588.3467	586.1907	569.0203	536.1402	504.3051	472.1708	454.6908	457.9320	474.2349	506.6745	542.6192	574.0479	(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					1.8900	22.3313	0.5000	0.7000	0.7700	10.2371 (76)		
South					8.7306	50.9848	0.5000	0.7000	0.7700	107.9658 (78)		
Solar gains	118.2029	176.6990	228.5998	276.8333	290.4073	303.4820	291.4757	281.8234	262.7023	205.3717	144.0748	100.8090 (83)
Total gains	706.5496	762.8898	797.6200	812.9735	794.7124	775.6528	746.1665	739.7554	736.9372	712.0461	686.6940	674.8570 (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	101.7399	102.0662	102.0662	102.5293	102.5293	103.0963	102.9601	103.2288	103.0963	102.8201	102.8201	102.3785
alpha	7.7827	7.8044	7.8044	7.8353	7.8353	7.8731	7.8640	7.8819	7.8731	7.8547	7.8547	7.8252
util living area	0.9846	0.9708	0.9308	0.8321	0.6511	0.4201	0.2713	0.2817	0.5119	0.8121	0.9576	0.9881 (86)
MIT	20.6378	20.7115	20.8209	20.9136	20.9539	20.9603	20.9604	20.9605	20.9596	20.9273	20.7855	20.6175 (87)
Th 2	20.1622	20.1647	20.1647	20.1681	20.1681	20.1723	20.1713	20.1733	20.1723	20.1703	20.1703	20.1670 (88)
util rest of house	0.9788	0.9605	0.9083	0.7881	0.5874	0.3507	0.1987	0.2089	0.4396	0.7579	0.9409	0.9835 (89)
MIT 2	19.7571	19.8495	19.9780	20.0792	20.1135	20.1216	20.1205	20.1226	20.1213	20.0954	19.9449	19.7363 (90)
Living area fraction	20.1072	20.1921	20.3130	20.4109	20.4475	20.4549	20.4544	20.4557	20.4545	20.4260	20.2790	20.0866 (92)
MIT	20.1072	20.1921	20.3130	20.4109	20.4475	20.4549	20.4544	20.4557	20.4545	20.4260	20.2790	20.0866 (93)
Temperature adjustment												0.0000
adjusted MIT	20.1072	20.1921	20.3130	20.4109	20.4475	20.4549	20.4544	20.4557	20.4545	20.4260	20.2790	20.0866 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9783	0.9609	0.9127	0.8016	0.6092	0.3744	0.2235	0.2338	0.4643	0.7755	0.9434	0.9830 (94)
Useful gains	691.2425	733.0411	728.0183	651.6966	484.1027	290.4059	166.7783	172.9404	342.1796	552.2025	647.8373	663.3639 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	991.5972	961.0905	850.4994	689.1562	488.3039	290.4855	166.7793	172.9418	342.6212	577.0525	802.8120	984.0595 (97)
Space heating kWh	223.4639	153.2492	91.1259	26.9709	3.1257	0.0000	0.0000	0.0000	0.0000	18.4885	111.5817	238.5975 (98a)
Space heating requirement - total per year (kWh/year)												866.6034
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	223.4639	153.2492	91.1259	26.9709	3.1257	0.0000	0.0000	0.0000	0.0000	18.4885	111.5817	238.5975 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.6034
Space heating per m2												11.8856 (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 %)	88.8000 (206)

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Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	223.4639	153.2492	91.1259	26.9709	3.1257	0.0000	0.0000	0.0000	0.0000	18.4885	111.5817	238.5975 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	251.6485	172.5779	102.6193	30.3727	3.5200	0.0000	0.0000	0.0000	0.0000	20.8203	125.6551	268.6909 (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	264.8122	234.2439	248.8104	218.4528	211.5893	190.4507	187.7242	195.2410	197.4657	220.4508	234.7454	261.8650 (64)
Efficiency of water heater (217)m	83.6815	83.1322	82.0286	80.6988	79.9179	79.8000	79.8000	79.8000	79.8000	80.4308	82.4937	79.8000 (216)
Fuel for water heating, kWh/month	316.4525	281.7727	303.3213	270.7013	264.7582	238.6601	235.2433	244.6629	247.4508	274.0877	284.5615	83.8517 (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	312.2955 (219)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.6742	16.5856	14.9335	10.9409	8.4511	6.9046	7.7094	10.0209	13.0162	17.0780	19.2895	21.2488 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.6565	-44.6769	-69.3808	-83.6455	-90.7944	-87.2513	-85.5328	-80.6604	-70.0063	-55.2665	-36.3134	-26.5109 (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	-16.7935	-34.9430	-80.8211	-145.1203	-200.4943	-225.6847	-217.2683	-178.7898	-116.7933	-58.3695	-24.1526	-12.5791 (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												975.9047 (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												3273.9678 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												166.8530 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2073.5052 (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												2429.2202 (238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	975.9047	5.6000	54.6507 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3273.9678	5.6000	183.3422 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	166.8530	26.0600	43.4819 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-761.6958	26.0600	-198.4979
PV Unit electricity exported	-1311.8095	5.8100	-76.2161
Total			-274.7140 (252)
Total energy cost			128.1723 (255)

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	975.9047	0.2100	204.9400 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3273.9678	0.2100	687.5332 (264)
Space and water heating			892.4732 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.8530	0.1443	24.0820 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-761.6958	0.1336	-101.7296
PV Unit electricity exported	-1311.8095	0.1221	-160.1424
Total			-261.8720 (269)
Total CO2, kg/year			666.6125 (272)

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----- 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	975.9047	1.1300	1102.7723 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3273.9678	1.1300	3699.5836 (278)
Space and water heating			4802.3559 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	166.8530	1.5338	255.9247 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-761.6958	1.4935	-1137.6253
PV Unit electricity exported	-1311.8095	0.4479	-587.4987
Total			-1725.1240 (283)
Total Primary energy kWh/year			3463.2574 (286)