



Environmental Standards Statement

45 Wilton Road, Manchester

Stroma Reference: OP-F110
Date: 13/11/2025
Prepared for: Bubby Kaur Vig



1. Executive Summary

This Environmental Standards Statement has been produced on behalf of Bubby Kaur Vig to support the planning application for the proposed construction of 2no semi-detached dwellings on land at 45 Wilton Road, Manchester.

This report outlines how the proposed development meet Building Regulations 2021 Part L1A and meet the requirements within Chapter 4 of the 'Guide to Development in Manchester and policies EN4 and EN6 of the Core Strategy for the City of Manchester (adopted 11th July 2012), confirm the proposals for the provision of onsite renewable energy to provide 20% of final site energy demand and CO2 reduction.

Although the development is not 10 or more units and policy EN6 does not apply the proposed energy strategy will undertake a fabric first approach and incorporate renewable technology on-site via air source heat pumps, which are a zero NOx solution at the source, providing space heating and domestic hot water generation from a low carbon source.

The below results show that the proposed development can achieve a 58.78% reduction on the dwelling (carbon dioxide) emission rate (DER) against Target Emission Rate (TER) as defined in the 2021 Building Regulations. With the integration of air source heat pumps the development can provide 92.57% of the predicted regulated energy contribution from a low carbon source.

1.1. Results Summary

	Carbon dioxide emissions (Tonnes CO2 per annum)	Stage saving (Tonnes CO2 per annum)	Improvement (%)
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.73		
Site Wide CO2 savings	1.13	1.60	58.78%

Table 1. Predicted site wide regulated annual carbon dioxide savings

	Predicted energy consumption (kWh per annum)	Predicted heat pump energy (kWh per annum)	Improvement (%)
Contribution form a low carbon source	7,601.70	7,036.60	92.57%

Table 2. Predicted site wide regulated energy contribution form a low carbon source

Contents

1. EXECUTIVE SUMMARY	2
1.1. RESULTS SUMMARY	2
2. QUALITY MANAGEMENT	4
3. INTRODUCTION.....	5
4. DEVELOPMENT SITE	6
5. PLANNING POLICY	7
5.1. NATIONAL POLICY - ENGLAND.....	7
5.2 PLANNING CONDITIONS.....	7
5.2. POLICY EN4 – REDUCING CO2 EMISSIONS BY ENABLING LOW AND ZERO CARBON DEVELOPMENT	7
5.3. POLICY EN6 – TARGET FRAMEWORK FOR CO2 REDUCTIONS FROM LOW OR ZERO CARBON ENERGY SUPPLIES	8
6. ASSESSMENT METHODOLOGY.....	9
6.1. BUILDING REGULATIONS - APPROVED DOCUMENT L VOLUME 1 DOMESTIC.....	9
6.2. DOMESTIC (SAP 10.2).....	9
7. ENERGY STRATEGY REVIEW	10
7.1. BUILDING FABRIC - RESIDENTIAL	10
7.2. BUILDING SERVICES - RESIDENTIAL	11
7.3. SOLAR PHOTOVOLTAICS (PV).....	12
8. SUMMARY	13
9. APPENDICES	14
9.1. APPENDIX 1: SAP 10.2 WORKSHEETS.....	14

2. Quality Management

Prepared by		Checked by	
Matthew Stainrod		Rob Waiting BSc (hons) MSc	
Sustainability Consultant		Principal Sustainability Consultant	
Date: 13/11/2025		Date: 13/11/2025	
File reference:	OP-F110 ES1		

Version	Status	Date	Change Summary

3. Introduction

Stroma Built Environment has been commissioned to prepare an Environmental Standards Statement to support the planning application for the proposed construction of 2no semi-detached dwellings on land at 45 Wilton Road, Manchester.

This report outlines how the proposed development meet Building Regulations 2021 Part L1A and meet the requirements within Chapter 4 of the 'Guide to Development in Manchester and policies EN4 and EN6 of the Core Strategy for the City of Manchester (adopted 11th July 2012), confirm the proposals for the provision of onsite renewable energy to provide 20% of final site energy demand and CO₂ reduction.

The energy strategy will undertake a fabric first approach and incorporate renewable technology on-site via air source heat pumps, which are a zero NOx solution at the source, providing space heating and domestic hot water generation from a low carbon source.

The proposed development is to demolish the existing bungalow on site and erect two semi-detached houses with private amenity and car parking space.



5. Planning Policy

5.1. National Policy - England

This policy requires that all developments meet set targets for CO2 emissions. These targets are set in the context of the Building Regulations UK Part L 2021.

The Department for Communities and Local Government (DCLG) released the National Planning Policy Framework (NPPF) in March 2021. In revising this framework, the Government's objective is to streamline the process encouraging sustainable development and promoting the needs and priorities of local communities.

This framework is to be used as the base by councils to develop their own local policy. Section 14 of the framework addresses climate change, flooding and coastal change. Considerations include:

- Minimising CO2 emissions
- Vulnerability of fuel supply
- A promotion of decentralised, low carbon and renewable energy sources wherever viable

5.2 Planning Conditions

As outlined within the City Council's Guide to Development in Manchester SPD/SPG, (chapter 4) and Core Strategy policies EN4 and EN6 an Environmental Standards Statement should be submitted with your application, which addresses sustainability ratings and the provision of renewable energy within the development (Please refer to Appendix A of the Core Strategy for guidance on preparing this statement). This should include a BREEAM pre-assessment rating through the submission of a pre-estimator report which should demonstrate that a rating level of at least Very Good would be achieved. Where this standard is not achievable clear reasons why need to be set out within the submission. This statement must address the guidance within Chapter 4 of the 'Guide to Development in Manchester and policies EN4 and EN6 of the Core Strategy for the City of Manchester, confirm the proposals for the provision of onsite renewable energy to provide 20% of final site energy demand and CO2 reduction.

5.2. Policy EN4 – Reducing CO2 Emissions by Enabling Low and Zero Carbon Development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO2 emissions, and rising fossil fuel prices, through the following actions:

- All development must follow the principle of the Energy Hierarchy, being designed
- To reduce the need for energy through design features that provide passive, natural lighting and cooling
- To reduce the need for energy through energy efficient features such as improved insulation and glazing
- To meet residual energy requirements through the use of low or zero carbon energy generating technologies

- Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.
- Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.
- Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.
- The use of building materials with low embodied carbon in new development and refurbishment schemes.

5.3. Policy EN6 – Target Framework for CO2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sq m will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO2 emissions for all phases of the development.

Developments smaller than the above threshold, but involving the erection of a building or substantial improvement to an existing building will also be expected to meet the minimum target, where viable, but will not be expected to submit an energy statement.

The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows

- Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling).
- Target 2 Electricity intense areas: Locations where the predominant building type has an all electric fit-out such as retail units and leisure complexes.
- Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical.

6. Assessment Methodology

6.1. Building Regulations - Approved Document L Volume 1 Domestic

Approved Document L Volume 1 Conservation of Fuel and Power sets the standard for carbon emissions for new dwellings and was last revised in June 2022 (Part L: 2021). The properties will need to comply with the criteria set out in the document, as follows:

1. The predicted Dwelling Emission Rate of CO₂ emissions from dwellings (DER) are not greater than the Target Emission Rate (TER).
2. The fabric energy efficiency rates for the building shall be no greater than the target fabric energy efficiency rate
3. The primary energy rate for the building shall be no greater than the target primary energy rate
4. That the performance of dwellings as built comply with the DER values achieved, including site testing that the 'air permeability' rate achieved is as per that specified, or better.
5. The necessary provisions for energy efficient operation of dwellings are put in place, including operation and maintenance instructions aimed at achieving economy in the use of fuel and power in a way that householders can understand.

6.2. Domestic (SAP 10.2)

The Standard Assessment Procedure (SAP 10.2) is the Government's approved methodology for assessing the predicted energy consumption and carbon dioxide emissions of new dwellings. Results are derived in respect of floor area and consider energy use (kWh/m²/yr) and associated CO₂ emissions (kg.CO₂/m²/yr) from the following:

- Space heating
- Domestic hot water
- Ventilation
- Lighting
- Ancillary pumps and fans
- Energy generating technology

SAP is compliant with the EU Energy Performance of Buildings Directive and is carried out using approved software. A trained and accredited Elmhurst Energy Assessor has used Elmhurst Design SAP 10.2 software to assess compliance and generate the necessary results data. SAP calculations have been undertaken for both dwellings and results have been used to determine the predicted energy consumption and CO₂ emissions for the entire development. The Full SAP calculations (DER/TER, DFEE/TFEE & DPER/TPER calculations have been provided within the appendix.

7. Energy Strategy Review

This section outlines the proposals for specifying building fabric and services beyond the requirements of Building Regulations (the baseline).

Fundamental to achieving energy efficiency in any new building is the specification of a thermally efficient building envelope. Passive design features such as high levels of insulation, designing to maximise solar gain and limiting heat loss through reduced air leakage and enhanced thermal bridging are all proven techniques to reduce energy consumption and emissions.

7.1. Building Fabric - Residential

The specification has been provide by the Design Team on this development in order to meet the fabric efficiency targets for Building Regulations 2021. It should also be noted the specification is subject to review, and as such U-Values, G-Values and thermal bridging details will be investigated further throughout the design stage, with the aim of limiting heat loss, and to reduce emissions as much as practically possible.

Compliance has been attained by targeting values surpassing the notional u-values set out within 'Table 1.1: Summary of notional dwelling specification for new dwelling', Approved Document L Volume 1. The Target Fabric Energy Efficiency (TFEE) has been achieved by incorporating a combination of enhanced u-values of the external walls, roofs and floors, double glazing, enhanced thermal bridging and airtightness.

Table 3 shows the proposed building fabric specification applied to the SAP calculations with respect to the upper limits stipulated by Part L: 2021. It can be seen that the values represent in some areas a significant bettering of the mandatory requirements set out in the current Building Regulations (2021).

Element	ADL (vol1): 2021 Limiting U-value	Proposed U-value	Improvement (%)
Floors	0.18	0.13	28%
Walls	0.26	0.18	31%
Roofs	0.16	0.11	31%
Front Door	1.60	1.20	25%
Windows/Glazed Doors	1.60	1.20	25%
y-value (thermal bridging)	0.20	0.056	72%
Air permeability (m³/h.m² @ 50 Pa)			
All dwellings (tested separately)	8.00	5.01	37%

Table 3. Building fabric specification (residential)

This assessment utilises notional thermal bridging values used in the notional SAP specification. The TER calculation utilises these values along with other specification elements to produce target emissions and energy criterion. Utilising notional thermal bridging here will not benefit the assessment nor significantly hinder modelled emissions as the TER calculation (baseline) incorporates the exact same figures.

7.2. Building Services - Residential

Space heating and domestic hot water (DHW) will be provided by air source heat pumps with hot water cylinders to each individual dwelling. Air source heat pumps (ASHP) extract heat from ambient air via a reversed refrigeration cycle. Heat is absorbed into an evaporator (outdoor unit) and increased via compression. This useful heat is transferred to the building via a refrigerant to provide space and/or water heating.

Although the system uses electricity, high Coefficient of Performances (COP) can be achieved resulting in overall CO₂ emissions and running costs below that of an efficient gas-fired boiler. The COP is a function of the difference between ambient air (source) temperature and output (flow) temperature.

Ventilation to all dwellings will be via intermittent extract fans installed within the kitchen and all wet rooms.

Low energy lighting will be specified throughout, exact fittings are not known at this stage however reasonable assumptions have been made for this assessment.

It should also be noted the specification is subject to review, and as such a HVAC specialist should be appointed at the earliest opportunity to confirm the space heating, water heating and ventilation will be investigated further throughout the design stage, with the aim to reduce emissions as much as practically possible. For the purpose of this assessment we have used a Mitsubishi Ecodan R32 PUZWM60VAAA Air Source Heat Pump (index number 104637).

Element	Specification (Apartments)
Space Heating	Air Source Heat Pump – approx 270% efficiency Flow temperature 45°C
Heating emitter	Radiators
Heating control	Programmer, Room Thermostat and TRVs
Domestic Hot Water (DHW)	Hot water cylinder
Water consumption	≤125 litres/person/day
Internal fixed lighting	100% low energy. 35 Fittings, 80 Lm/W (SAP LED default fittings)
Ventilation	Intermittent Extract Fans

Table 4. Building services specification (residential)

7.3. Solar Photovoltaics (PV)

Solar Photovoltaic (PV) panels comprise a number of inter-connected cells that utilise semiconductor technology to convert solar energy into electricity. High voltage, direct current is converted to alternating current and phased into the mains supply via an inverter. PV panels are most effective where mounted on exposed, south-facing areas, at an inclination close to 30° from the horizontal.

The technology is well proven and requires little maintenance; most panels are designed to be self-cleaning when mounted at appropriate angles and the design life of a panel typically exceeds the likely pay-back period by a considerable margin. PV has the significant advantage of reducing energy use and costs on site for residents whilst also reducing demand from the national grid and even contributing to grid energy. This can save significant carbon dioxide emissions by reducing the relatively inefficient and fossil-fuel heavy heat generation in the national infrastructure.

The proposed dwellings have a south facing rear elevation with a dormer roof resulting in very little available roof space to install PV panels. Due to the calculation methodology the space available for PV Panels is less than the amount allocated to the notional building therefore making PV panels not a viable option for this development.

8. Summary

This report outlines how the proposed development will achieve compliance with Building Regulations 2021 Part L1A and meet the requirements within Chapter 4 of the 'Guide to Development in Manchester and policies EN4 and EN6 of the Core Strategy for the City of Manchester (adopted 11th July 2012).

The proposed energy strategy will undertake a fabric first approach and incorporate renewable technology on-site via air source heat pumps, which are a zero NOx solution at the source, providing space heating and domestic hot water generation from a low carbon source. The installation of PV panels has been reviewed however due to very little available roof space it is not a viable option for this development.

Based on the proposed energy strategy the below results show that the proposed development can achieve a 58.78% reduction on the dwelling (carbon dioxide) emission rate (DER) against Target Emission Rate (TER) as defined in the 2021 Building Regulations. With the integration of air source heat pumps the development can provide 92.57% of the predicted regulated energy contribution from a low carbon source.

	Carbon dioxide emissions (Tonnes CO2 per annum)	Stage saving (Tonnes CO2 per annum)	Improvement (%)
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.73		
Site Wide CO2 savings	1.13	1.60	58.78%

Table 5. Predicted site wide regulated annual carbon dioxide savings

	Predicted energy consumption (kWh per annum)	Predicted heat pump energy (kWh per annum)	Improvement (%)
Contribution form a low carbon source	7,601.70	7,036.60	92.57%

Table 6. Predicted site wide regulated energy contribution form a low carbon source

9. Appendices

9.1. Appendix 1: SAP 10.2 Worksheets

Full SAP Calculation Printout



Property Reference	Plot 1				Issued on Date	13/11/2025		
Assessment Reference	00001			Prop Type Ref	Plot 1			
Property								
SAP Rating	81 B		DER	3.85		TER	9.34	
Environmental	96 A		% DER < TER				58.78	
CO ₂ Emissions (t/year)	0.54		DFEE	37.13		TFEE	38.04	
Compliance Check	See BREL		% DFEE < TFEE				2.40	
% DPER < TPER	17.38		DPER	40.23		TPER	48.69	
Assessor Details	Mr. Matthew Stainrod					Assessor ID	AU83-0001	
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	62.9100 (1b)	x 2.5800 (2b)	= 162.3078 (1b) - (3b)
First floor	50.1400 (1c)	x 2.7500 (2c)	= 137.8850 (1c) - (3c)
Second floor	33.2500 (1d)	x 2.1500 (2d)	= 71.4875 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 371.6803 (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) =	0.1076 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0100	(17)
Infiltration rate	0.3581	(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) =	0.3044 (21)

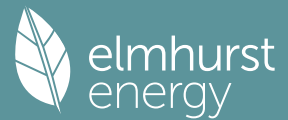
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3881	0.3805	0.3729	0.3348	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577 (22b)
Effective ac	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1000	1.0000	2.1000		(26)
Window			31.0800	1.1450	35.5878		(27)
Roof Window			2.4000	1.1450	2.7481		(27a)
Ground Floor			62.9100	0.1300	8.1783	110.0000	6920.1000 (28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324	150.0000	14277.0000 (29a)
Stud wall to loft	12.4700		12.4700	0.0800	0.9976	9.0000	112.2300 (29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670	9.0000	118.3500 (29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286	9.0000	362.3400 (30)
Ceiling to loft space	16.9000		16.9000	0.0800	1.3520	9.0000	152.1000 (30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484	9.0000	93.9600 (30)
Total net area of external elements A _{um} (A, m ²)			286.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		76.0402		(33)
Main dwelling							
Party Wall			51.7400	0.0000	0.0000	70.0000	3621.8000 (32)
Block			74.0000			75.0000	5550.0000 (32c)
Stud			143.0000			9.0000	1287.0000 (32c)
First			50.1400			18.0000	902.5200 (32d)
Second			33.2500			18.0000	598.5000 (32d)

[illegible]

Full SAP Calculation Printout



729.3638 746.6386 715.1057 689.0992 653.1896 628.8596 604.1056 605.1953 623.9373 645.9418 686.6318 713.6309 (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					6.4700	10.6334	0.6300	0.7000				0.7700			21.0256 (74)
Northeast					2.7000	11.2829	0.6300	0.7000				0.7700			9.3102 (75)
East					4.9900	19.6403	0.6300	0.7000				0.7700			29.9516 (76)
South					14.2200	46.7521	0.6300	0.7000				0.7700			203.1759 (78)
Northwest					2.7000	11.2829	0.6300	0.7000				0.7700			9.3102 (81)
North					2.4000	15.6897	0.6300	0.7000				1.0000			14.9454 (82)

Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600 (83)			
Total gains	1017.0826	1244.0965	1422.2841	1621.1873	1756.4313	1752.3747	1675.3749	1543.0019	1407.3275	1202.2201	1032.4252	959.1910 (84)			

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.3650	59.4963	59.6255	60.2401	60.3565	60.9043	60.9043	61.0068	60.6921	60.3565	60.1215	59.8778
alpha	4.9577	4.9664	4.9750	5.0160	5.0238	5.0603	5.0603	5.0671	5.0461	5.0238	5.0081	4.9919
util living area	0.9952	0.9867	0.9657	0.8987	0.7579	0.5629	0.4133	0.4661	0.7168	0.9368	0.9886	0.9964 (86)
Living	19.6912	19.9356	20.2510	20.6286	20.8796	20.9785	20.9963	20.9933	20.9316	20.5859	20.0669	19.6508
Non living	18.8076	19.0508	19.3602	19.7204	19.9311	20.0053	20.0136	20.0142	19.9769	19.6920	19.1899	18.7735
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	20.3305	19.9356	20.2510	20.6286	20.8796	20.9785	20.9963	20.9933	20.9316	20.5859	20.0669	19.8395 (87)
Th 2	19.9916	19.9936	19.9955	20.0047	20.0065	20.0145	20.0145	20.0160	20.0114	20.0065	20.0030	19.9993 (88)
util rest of house	0.9937	0.9827	0.9553	0.8700	0.7007	0.4829	0.3223	0.3692	0.6363	0.9121	0.9844	0.9952 (89)
MIT 2	19.3859	19.0508	19.3602	19.7204	19.9311	20.0053	20.0136	20.0142	19.9769	19.6920	19.1899	18.9450 (90)
Living area fraction	FLA = Living area / (4) =											0.1239 (91)
MIT	19.5029	19.1604	19.4705	19.8329	20.0486	20.1258	20.1353	20.1354	20.0952	19.8027	19.2985	19.0558 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5029	19.1604	19.4705	19.8329	20.0486	20.1258	20.1353	20.1354	20.0952	19.8027	19.2985	19.0558 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9928	0.9782	0.9485	0.8643	0.7033	0.4922	0.3336	0.3812	0.6437	0.9059	0.9804	0.9937 (94)
Useful gains	1009.7158	1217.0247	1349.0671	1401.2462	1235.2413	862.4607	558.8281	588.1903	905.8327	1089.0685	1012.2224	953.1942 (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	2471.9032	2313.5492	2099.7204	1751.8066	1335.1314	875.7568	560.2903	591.0175	953.4682	1471.7323	1958.4581	2394.7813 (97)
Space heating kWh	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98a)
Space heating requirement - total per year (kWh/year)												4748.4721
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	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4748.4721
Space heating per m2										(98c) / (4) =		32.4571 (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 %)												277.9600 (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	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98)
Space heating efficiency (main heating system 1)	277.9600	277.9600	277.9600	277.9600	277.9600	0.0000	0.0000	0.0000	0.0000	277.9600	277.9600	277.9600 (210)
Space heating fuel (main heating system)	391.3755	265.0973	200.9232	90.8057	26.7370	0.0000	0.0000	0.0000	0.0000	102.4255	245.1035	385.8615 (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	337.1949	298.2746	316.4600	276.5643	267.0991	239.5371	235.2823	245.0690	248.3062	278.3051	297.7604	333.2356 (64)
Efficiency of water heater (217)m	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613 (216)
Fuel for water heating, kWh/month	180.9361	160.0518	169.8099	148.4022	143.3233	128.5337	126.2506	131.5021	133.2391	149.3363	159.7759	178.8116 (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	35.0093	28.0858	25.2881	18.5272	14.3109	11.6921	13.0549	16.9692	22.0414	28.9195	32.6645	35.9823 (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)

Full SAP Calculation Printout



Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1708.3292	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													186.3613	
Water heating fuel used													1809.9725	(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)													282.5451	(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													3800.8468	(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	1708.3292	0.1565	267.3014	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1809.9725	0.1410	255.2254	(264)
Space and water heating			522.5269	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	282.5451	0.1443	40.7800	(268)
Total CO2, kg/year			563.3069	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1708.3292	1.5792	2697.8628	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1809.9725	1.5214	2753.7138	(278)
Space and water heating			5451.5766	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	282.5451	1.5338	433.3772	(282)
Total Primary energy kWh/year			5884.9538	(286)
Dwelling Primary energy Rate (DPER)			40.2300	(287)

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

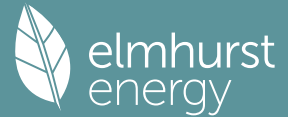
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	62.9100 (1b)	x 2.5800 (2b)	= 162.3078	(1b) - (3b)
First floor	50.1400 (1c)	x 2.7500 (2c)	= 137.8850	(1c) - (3c)
Second floor	33.2500 (1d)	x 2.1500 (2d)	= 71.4875	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 371.6803	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		

Full SAP Calculation Printout



Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1076 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3576 (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) =	0.3040 (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	0.3876	0.3800	0.3724	0.3344	0.3268	0.2888	0.2888	0.2812	0.3040	0.3268	0.3420	0.3572	(22b)
	0.5751	0.5722	0.5693	0.5559	0.5534	0.5417	0.5417	0.5395	0.5462	0.5534	0.5585	0.5638	(25)

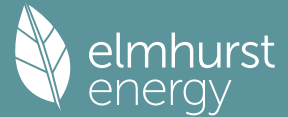
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			31.0800	1.1450	35.5878			(27)
TER Roof Window			2.4000	1.1450	3.6090			(27a)
Ground Floor			62.9100	0.1300	8.1783			(28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324			(29a)
Stud wall to loft	12.4700		12.4700	0.1800	2.2446			(29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670			(29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286			(30)
Ceiling to loft space	16.9000		16.9000	0.1100	1.8590			(30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484			(30)
Total net area of external elements Aum(A, m2)			286.8900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.6551			(33)
Main dwelling								
Party Wall			51.7400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.5171	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				19.2800	0.0500	0.9640		
E3 Sill				14.6000	0.0500	0.7300		
E3 Sill				47.3000	0.0500	2.3650		
E5 Ground floor (normal)				23.2500	0.1600	3.7200		
E6 Intermediate floor within a dwelling				19.2000	0.0000	0.0000		
E11 Eaves (insulation at rafter level)				20.9000	0.0400	0.8360		
E13 Gable (insulation at rafter level)				11.1100	0.0800	0.8888		
E16 Corner (normal)				24.9100	0.0900	2.2419		
E17 Corner (inverted - internal area greater than external area)				10.5000	-0.0900	-0.9450		
P1 Party wall - Ground floor				9.0700	0.0800	0.7256		
P2 Party wall - Intermediate floor within a dwelling				11.7400	0.0000	0.0000		
P5 Party wall - Roof (insulation at rafter level)				11.1100	0.0800	0.8888		
R1 Head of roof window				4.2000	0.0800	0.3360		
R2 Sill of roof window				4.2000	0.0600	0.2520		
R3 Jamb of roof window				8.4000	0.0800	0.6720		
R4 Ridge (vaulted ceiling)				6.7200	0.0800	0.5376		
R5 Ridge (inverted)				6.7200	0.0400	0.2688		
R6 Flat ceiling				9.5600	0.0600	0.5736		
R8 Roof to wall (rafter)				5.9000	0.0600	0.3540		
E18 Party wall between dwellings				9.6700	0.0600	0.5802		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9893	(36)
Point Thermal Bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	94.6444	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9282 (42)
Hot water usage for mixer showers	73.3168	72.2150	70.6095	67.5375	65.2705	62.7424	61.3054	62.8988	64.6454	67.3599	70.4978	73.0359 (42a)
Hot water usage for baths	31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449 (42b)
Hot water usage for other uses	44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181 (42c)
Average daily hot water use (litres/day)												137.5039 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	149.5868	146.3925	142.5025	136.5875	131.7841	126.6201	124.6357	128.5089	132.5938	138.0151	144.0212	149.1989 (44)
Energy conte	236.9090	208.4609	219.0210	186.9815	177.4067	155.6942	150.7361	159.1209	163.5014	187.2852	205.1845	233.6095 (45)
Energy content (annual)	Total = Sum(45)m =											2283.9108 (45)
Distribution loss (46)m = 0.15 x (45)m												
	35.5363	31.2691	32.8532	28.0472	26.6110	23.3541	22.6104	23.8681	24.5252	28.0928	30.7777	35.0414 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)

Full SAP Calculation Printout



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	287.8351	254.4587	269.9471	236.2648	228.3328	204.9775	201.6621	210.0469	212.7847	238.2112	254.4678	284.5355 (62)
WWHRS	-33.5174	-29.6431	-31.0405	-25.7028	-23.9541	-20.4977	-19.2133	-20.4314	-21.2077	-25.0015	-28.3237	-32.8967 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	254.3177	224.8156	238.9066	210.5620	204.3788	184.4798	182.4489	189.6155	191.5770	213.2097	226.1442	251.6388 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2572.0946 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	119.5131	106.1115	113.5653	101.5980	99.7286	91.1949	90.8606	93.6485	93.7908	103.0132	107.6505	118.4160 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	159.6219	176.7243	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219	164.9426	159.6219	164.9426	159.6219	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.4683	319.7522	311.4768	293.8593	271.6205	250.7191	236.7557	233.4717	241.7472	259.3646	281.6035	302.5049	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	(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)	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	(71)
Water heating gains (Table 5)	160.6359	157.9039	152.6416	141.1083	134.0438	126.6596	122.1245	125.8717	130.2651	138.4586	149.5146	159.1613	(72)
Total internal gains	706.6497	724.3041	693.6639	669.8339	635.2098	609.2450	585.4257	585.8890	603.8785	627.3687	665.9843	691.2117	(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					6.4700	10.6334		0.6300	0.7000	0.7700		21.0256 (74)	
Northeast					2.7000	11.2829		0.6300	0.7000	0.7700		9.3102 (75)	
East					4.9900	19.6403		0.6300	0.7000	0.7700		29.9516 (76)	
South					14.2200	46.7521		0.6300	0.7000	0.7700		203.1759 (78)	
Northwest					2.7000	11.2829		0.6300	0.7000	0.7700		9.3102 (81)	
North					2.4000	15.6897		0.6300	0.7000	1.0000		14.9454 (82)	

Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600 (83)	
Total gains	994.3685	1221.7620	1400.8424	1601.9220	1738.4516	1732.7601	1656.6950	1523.6955	1387.2687	1183.6471	1011.7777	936.7717 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.4345	58.5614	58.6862	59.2798	59.3922	59.9210	59.9210	60.0200	59.7162	59.3922	59.1652	58.9298
alpha	4.8956	4.9041	4.9124	4.9520	4.9595	4.9947	4.9947	5.0013	4.9811	4.9595	4.9443	4.9287
util living area	0.9957	0.9879	0.9684	0.9053	0.7691	0.5761	0.4243	0.4787	0.7310	0.9418	0.9897	0.9967 (86)
MIT	19.6455	19.8914	20.2117	20.6005	20.8660	20.9748	20.9955	20.9920	20.9222	20.5578	20.0275	19.6051 (87)
Th 2	19.9772	19.9791	19.9811	19.9903	19.9920	20.0000	20.0000	20.0014	19.9969	19.9920	19.9885	19.9849 (88)
util rest of house	0.9943	0.9841	0.9587	0.8776	0.7121	0.4939	0.3297	0.3782	0.6500	0.9185	0.9859	0.9957 (89)
MIT 2	18.4039	18.7176	19.1210	19.5961	19.8837	19.9860	19.9985	19.9986	19.9461	19.5588	18.8995	18.3577 (90)
Living area fraction	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (92)
MIT Temperature adjustment	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (93)
adjusted MIT	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (93)

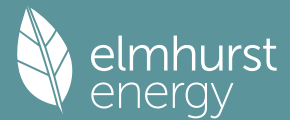
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9915	0.9785	0.9497	0.8690	0.7129	0.5031	0.3414	0.3906	0.6561	0.9094	0.9808	0.9934	(94)
Useful gains	985.8815	1195.4577	1330.3779	1392.0241	1239.3095	871.7605	565.5747	595.1113	910.2485	1076.4417	992.3108	930.6268	(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	2355.1298	2301.4670	2098.0670	1761.8782	1349.7967	887.3436	567.3446	598.5182	964.4928	1476.0953	1947.8034	2344.2700	(97)
Space heating kWh	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506	(98a)
Space heating requirement - total per year (kWh/year)												4718.6647	
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	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4718.6647	
Space heating per m2	(98c) / (4) =											32.2533	(99)

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

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

Full SAP Calculation Printout



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	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506	(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)	1103.7062	805.2419	618.8090	288.5102	89.0601	0.0000	0.0000	0.0000	0.0000	322.1477	745.3464	1139.4914	(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	254.3177	224.8156	238.9066	210.5620	204.3788	184.4798	182.4489	189.6155	191.5770	213.2097	226.1442	251.6388	(64)
Efficiency of water heater	86.8434	86.5335	85.9414	84.5875	82.1894	79.8000	79.8000	79.8000	79.8000	84.8058	86.3896	86.9077	(216)
Fuel for water heating, kWh/month	292.8464	259.8018	277.9877	248.9280	248.6681	231.1777	228.6327	237.6135	240.0714	251.4094	261.7725	289.5474	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.1663	26.6072	23.9569	17.5518	13.5575	11.0766	12.3676	16.0759	20.8810	27.3970	30.9449	34.0881	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-57.0777	-79.5772	-113.1041	-125.6442	-134.1240	-124.5903	-122.9154	-116.6132	-105.4208	-90.1308	-62.3775	-49.4408	(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)	-35.0349	-73.3598	-145.2289	-217.3430	-286.7027	-287.9315	-284.6714	-241.4568	-177.4593	-104.8070	-46.7308	-27.7423	(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												5112.3127	(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												3068.4565	(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)												267.6709	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3109.4844	(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												5424.9558	(238)

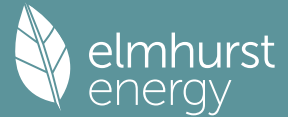
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5112.3127	0.2100	1073.5857	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3068.4565	0.2100	644.3759	(264)
Space and water heating			1717.9616	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	267.6709	0.1443	38.6332	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1181.0159	0.1349	-159.2645	
PV Unit electricity exported	-1928.4684	0.1260	-242.9710	
Total			-402.2355	(269)
Total CO2, kg/year			1366.2885	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5112.3127	1.1300	5776.9134	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3068.4565	1.1300	3467.3559	(278)
Space and water heating			9244.2693	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	267.6709	1.5338	410.5625	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1181.0159	1.4984	-1769.6486	
PV Unit electricity exported	-1928.4684	0.4625	-891.8774	
Total			-2661.5260	(283)
Total Primary energy kWh/year			7123.4067	(286)
Target Primary Energy Rate (TPER)			48.6900	(287)

Full SAP Calculation Printout



Property Reference	Plot 1	Issued on Date	13/11/2025
Assessment Reference	00001	Prop Type Ref	Plot 1
Property			
SAP Rating	81 B	DER	3.85
Environmental	96 A	% DER < TER	58.78
CO ₂ Emissions (t/year)	0.54	DFEE	37.13
Compliance Check	See BREL	% DFEE < TFEE	2.40
% DPER < TPER	17.38	DPER	40.23
Assessor Details	Mr. Matthew Stainrod	Assessor ID	AU83-0001
Client			

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)
Main dwelling			
Ground floor	62.9100 (1b)	x 2.5800 (2b)	= 162.3078 (1b) - (3b)
First floor	50.1400 (1c)	x 2.7500 (2c)	= 137.8850 (1c) - (3c)
Second floor	33.2500 (1d)	x 2.1500 (2d)	= 71.4875 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	371.6803 (5)

2. Ventilation rate

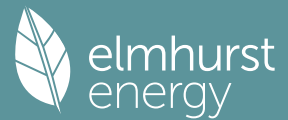
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1076 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.3581 (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) = 0.3044 (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	0.3881	0.3805	0.3729	0.3348	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577 (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	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1000	1.0000	2.1000		(26)
Window			31.0800	1.1450	35.5878		(27)
Roof Window			2.4000	1.1450	2.7481		(27a)
Ground Floor			62.9100	0.1300	8.1783	110.0000	6920.1000 (28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324	150.0000	14277.0000 (29a)
Stud wall to loft	12.4700		12.4700	0.0800	0.9976	9.0000	112.2300 (29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670	9.0000	118.3500 (29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286	9.0000	362.3400 (30)
Ceiling to loft space	16.9000		16.9000	0.0800	1.3520	9.0000	152.1000 (30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484	9.0000	93.9600 (30)
Total net area of external elements A _{um} (A, m ²)			286.8900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	76.0402	(33)
Main dwelling							
Party Wall			51.7400	0.0000	0.0000	70.0000	3621.8000 (32)
Block			74.0000			75.0000	5550.0000 (32c)
Stud			143.0000			9.0000	1287.0000 (32c)

Full SAP Calculation Printout



First	50.1400	18.0000	902.5200 (32d)
Second	33.2500	18.0000	598.5000 (32d)
Ground	50.4000	9.0000	453.6000 (32e)
First	33.2500	9.0000	299.2500 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 34748.7500 (34)

Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ 237.5171 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	19.2800	0.0500	0.9640
E2 Other lintels (including other steel lintels)	14.6000	0.0500	0.7300
E3 Sill	47.3000	0.0500	2.3650
E3 Sill	23.2500	0.1600	3.7200
E5 Ground floor (normal)	19.2000	0.0000	0.0000
E6 Intermediate floor within a dwelling	20.9000	0.0400	0.8360
E11 Eaves (insulation at rafter level)	11.1100	0.0800	0.8888
E13 Gable (insulation at rafter level)	24.9100	0.0900	2.2419
E16 Corner (normal)	10.5000	-0.0900	-0.9450
E17 Corner (inverted - internal area greater than external area)	9.0700	0.0800	0.7256
P1 Party wall - Ground floor	11.7400	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	11.1100	0.0800	0.8888
P5 Party wall - Roof (insulation at rafter level)	4.2000	0.0800	0.3360
R1 Head of roof window	4.2000	0.0600	0.2520
R2 Sill of roof window	8.4000	0.0800	0.6720
R3 Jamb of roof window	6.7200	0.0800	0.5376
R4 Ridge (vaulted ceiling)	6.7200	0.0400	0.2688
R5 Ridge (inverted)	9.5600	0.0600	0.5736
R6 Flat ceiling	5.9000	0.0600	0.3540
R8 Roof to wall (rafter)	9.6700	0.0600	0.5802
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.9893 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			92.0295 (37) (33) + (36) + (36a) =

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	70.5650	70.2063	69.8547	68.2032	67.8942	66.4558	66.4558	66.1894	67.0098	67.8942	68.5193	69.1728 (38)
Heat transfer coeff	162.5945	162.2358	161.8842	160.2327	159.9237	158.4853	158.4853	158.2189	159.0393	159.9237	160.5488	161.2023 (39)
Average = $\text{Sum}(39)\text{m} / 12 =$												160.2312
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1114	1.1089	1.1065	1.0952	1.0931	1.0833	1.0833	1.0815	1.0871	1.0931	1.0974	1.1019 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

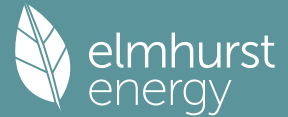
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9282 (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	31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449 (42b)
Hot water usage for other uses	44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181 (42c)
Average daily hot water use (litres/day)												69.9082 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	76.2700	74.1774	71.8930	69.0500	66.5136	63.8777	63.3303	65.6101	67.9483	70.6552	73.5233	76.1630 (44)
Distribution loss (46)m = 0.15 x (45)m	120.7930	105.6277	110.4969	94.5260	89.5401	78.5451	76.5925	81.2390	83.7871	95.8784	104.7474	119.2528 (45)
	Total = Sum(45)m =											1161.0260
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	102.6741	89.7835	93.9223	80.3471	76.1091	66.7633	65.1036	69.0532	71.2190	81.4966	89.0353	101.3649 (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	102.6741	89.7835	93.9223	80.3471	76.1091	66.7633	65.1036	69.0532	71.2190	81.4966	89.0353	101.3649 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											986.8721 (64)
Electric shower(s)	58.7146	52.3152	57.1262	54.5148	55.5377	52.9776	54.7435	55.5377	54.5148	57.1262	56.0520	58.7146 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											667.8748 (64a)
Heat gains from water heating, kWh/month	40.3472	35.5247	37.7621	33.7155	32.9117	29.9352	29.9618	31.1477	31.4334	34.6557	36.2718	40.0199 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	159.6219	176.7243	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219	164.9426	159.6219	164.9426	159.6219	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.4683	319.7522	311.4768	293.8593	271.6205	250.7191	236.7557	233.4717	241.7472	259.3646	281.6035	302.5049	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	(71)
Water heating gains (Table 5)	54.2301	52.8641	50.7555	46.8270	44.2362	41.5767	40.2712	41.8652	43.6576	46.5802	50.3775	53.7901	(72)
Total internal gains	597.2439	616.2642	588.7779	572.5527	542.4022	524.1621	503.5724	501.8825	517.2710	532.4904	563.8473	582.8406	(73)

Full SAP Calculation Printout



6. Solar gains

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

North					6.4700	10.6334		0.6300	0.7000	0.7700		21.0256 (74)
Northeast					2.7000	11.2829		0.6300	0.7000	0.7700		9.3102 (75)
East					4.9900	19.6403		0.6300	0.7000	0.7700		29.9516 (76)
South					14.2200	46.7521		0.6300	0.7000	0.7700		203.1759 (78)
Northwest					2.7000	11.2829		0.6300	0.7000	0.7700		9.3102 (81)
North					2.4000	15.6897		0.6300	0.7000	1.0000		14.9454 (82)

Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600 (83)
Total gains	884.9627	1113.7222	1295.9563	1504.6407	1645.6439	1647.6772	1574.8418	1439.6890	1300.6612	1088.7687	909.6407	828.4006 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.3650	59.4963	59.6255	60.2401	60.3565	60.9043	60.9043	61.0068	60.6921	60.3565	60.1215	59.8778
alpha	4.9577	4.9664	4.9750	5.0160	5.0238	5.0603	5.0603	5.0671	5.0461	5.0238	5.0081	4.9919
util living area	0.9974	0.9916	0.9760	0.9198	0.7891	0.5941	0.4388	0.4975	0.7566	0.9554	0.9934	0.9981 (86)
MIT	19.5917	19.8409	20.1674	20.5723	20.8545	20.9727	20.9951	20.9911	20.9125	20.5196	19.9767	19.5516 (87)
Th 2	19.9916	19.9936	19.9955	20.0047	20.0065	20.0145	20.0145	20.0160	20.0114	20.0065	20.0030	19.9993 (88)
util rest of house	0.9966	0.9890	0.9683	0.8952	0.7340	0.5114	0.3426	0.3952	0.6775	0.9365	0.9908	0.9975 (89)
MIT 2	18.7087	18.9578	19.2803	19.6714	19.9135	20.0026	20.0133	20.0135	19.9659	19.6327	19.1013	18.6747 (90)
Living area fraction	18.8180	19.0672	19.3902	19.7830	20.0301	20.1227	20.1349	20.1346	20.0831	19.7425	19.2097	18.7833 (92)
MIT	18.8180	19.0672	19.3902	19.7830	20.0301	20.1227	20.1349	20.1346	20.0831	19.7425	19.2097	18.7833 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8180	19.0672	19.3902	19.7830	20.0301	20.1227	20.1349	20.1346	20.0831	19.7425	19.2097	18.7833 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9857	0.9624	0.8888	0.7354	0.5209	0.3545	0.4078	0.6838	0.9301	0.9880	0.9964 (94)
Useful gains	880.6799	1097.7980	1247.2093	1337.2713	1210.2669	858.1940	558.2898	587.0427	889.4009	1012.6730	898.7410	825.4551 (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	2360.5505	2298.4190	2086.7198	1743.8150	1332.1777	875.2707	560.2254	590.8816	951.5556	1462.1087	1944.1966	2350.8683 (97)
Space heating kWh	1101.0237	806.8173	624.5958	292.7115	90.7016	0.0000	0.0000	0.0000	0.0000	334.3802	752.7280	1134.9074 (98a)
Space heating requirement - total per year (kWh/year)												5137.8656
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	1101.0237	806.8173	624.5958	292.7115	90.7016	0.0000	0.0000	0.0000	0.0000	334.3802	752.7280	1134.9074 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5137.8656
Space heating per m2												35.1187 (99)

8c. Space cooling requirement

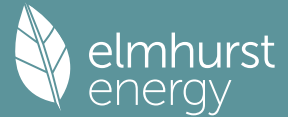
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	1489.7616	1172.7910	1202.4636	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9082	0.9525	0.9295	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1352.9726	1117.0254	1117.6705	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1832.0809	1752.0004	1603.1676	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	344.9580	472.4214	361.2099	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	86.2395	118.1054	90.3025	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												294.6473 (107)
Energy for space heating												35.1187 (99)
Energy for space cooling												2.0140 (108)
Total												37.1327 (109)
Fabric Energy Efficiency (DFEE)												37.1 (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 (m2)	Storey height (m)	Volume (m3)
Main dwelling			

Full SAP Calculation Printout



Ground floor	62.9100 (1b)	x	2.5800 (2b)	=	162.3078 (1b) - (3b)
First floor	50.1400 (1c)	x	2.7500 (2c)	=	137.8850 (1c) - (3c)
Second floor	33.2500 (1d)	x	2.1500 (2d)	=	71.4875 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000				(4)
Dwelling volume	(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =				371.6803 (5)

2. Ventilation rate

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3876	0.3800	0.3724	0.3344	0.3268	0.2888	0.2888	0.2812	0.3040	0.3268	0.3420	0.3572	(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	0.5751	0.5722	0.5693	0.5559	0.5534	0.5417	0.5417	0.5395	0.5462	0.5534	0.5585	0.5638	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			31.0800	1.1450	35.5878		(27)
TER Roof Window			2.4000	1.1450	3.6090		(27a)
Ground Floor			62.9100	0.1300	8.1783		(28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324		(29a)
Stud wall to loft	12.4700		12.4700	0.1800	2.2446		(29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670		(29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286		(30)
Ceiling to loft space	16.9000		16.9000	0.1100	1.8590		(30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484		(30)
Total net area of external elements Aum(A, m2)				286.8900			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.6551		(33)
Main dwelling							
Party Wall			51.7400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.5171 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.2800	0.0500	0.9640
E3 Sill	14.6000	0.0500	0.7300
E3 Sill	47.3000	0.0500	2.3650
E5 Ground floor (normal)	23.2500	0.1600	3.7200
E6 Intermediate floor within a dwelling	19.2000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	20.9000	0.0400	0.8360
E13 Gable (insulation at rafter level)	11.1100	0.0800	0.8888
E16 Corner (normal)	24.9100	0.0900	2.2419
E17 Corner (inverted - internal area greater than external area)	10.5000	-0.0900	-0.9450
P1 Party wall - Ground floor	9.0700	0.0800	0.7256
P2 Party wall - Intermediate floor within a dwelling	11.7400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	11.1100	0.0800	0.8888
R1 Head of roof window	4.2000	0.0800	0.3360
R2 Sill of roof window	4.2000	0.0600	0.2520
R3 Jamb of roof window	8.4000	0.0800	0.6720
R4 Ridge (vaulted ceiling)	6.7200	0.0800	0.5376
R5 Ridge (inverted)	6.7200	0.0400	0.2688
R6 Flat ceiling	9.5600	0.0600	0.5736
R8 Roof to wall (rafter)	5.9000	0.0600	0.3540
E18 Party wall between dwellings	9.6700	0.0600	0.5802
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.9893 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	94.6444 (37)

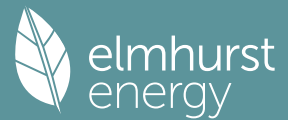
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	70.5392	70.1815	69.8309	68.1840	67.8759	66.4415	66.4415	66.1759	66.9940	67.8759	68.4992	69.1509	(38)
Heat transfer coeff	165.1837	164.8259	164.4753	162.8284	162.5203	161.0859	161.0859	160.8203	161.6384	162.5203	163.1436	163.7953	(39)
Average = Sum(39)m / 12 =													162.8269

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1291	1.1266	1.1242	1.1130	1.1109	1.1011	1.1011	1.0992	1.1048	1.1109	1.1151	1.1196	(40)
HLP (average)													1.1130
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Full SAP Calculation Printout



Assumed occupancy												2.9282 (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	(42a)
Hot water usage for baths	31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449 (42b)
Hot water usage for other uses	44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181 (42c)
Average daily hot water use (litres/day)												69.9082 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.2700	74.1774	71.8930	69.0500	66.5136	63.8777	63.3303	65.6101	67.9483	70.6552	73.5233	76.1630 (44)
Energy content (annual)	120.7930	105.6277	110.4969	94.5260	89.5401	78.5451	76.5925	81.2390	83.7871	95.8784	104.7474	119.2528 (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	102.6741	89.7835	93.9223	80.3471	76.1091	66.7633	65.1036	69.0532	71.2190	81.4966	89.0353	101.3649 (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	102.6741	89.7835	93.9223	80.3471	76.1091	66.7633	65.1036	69.0532	71.2190	81.4966	89.0353	101.3649 (64)
12Total per year (kWh/year)												986.8721 (64)
Electric shower(s)	58.7146	52.3152	57.1262	54.5148	55.5377	52.9776	54.7435	55.5377	54.5148	57.1262	56.0520	58.7146 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												667.8748 (64a)
Heat gains from water heating, kWh/month	40.3472	35.5247	37.7621	33.7155	32.9117	29.9352	29.9618	31.1477	31.4334	34.6557	36.2718	40.0199 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	159.6219	176.7243	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219	164.9426	159.6219	164.9426	159.6219 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.4683	319.7522	311.4768	293.8593	271.6205	250.7191	236.7557	233.4717	241.7472	259.3646	281.6035	302.5049 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297 (71)
Water heating gains (Table 5)	54.2301	52.8641	50.7555	46.8270	44.2362	41.5767	40.2712	41.8652	43.6576	46.5802	50.3775	53.7901 (72)
Total internal gains	597.2439	616.2642	588.7779	572.5527	542.4022	524.1621	503.5724	501.8825	517.2710	532.4904	563.8473	582.8406 (73)

6. Solar gains

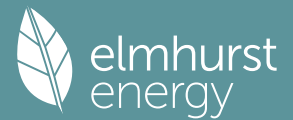
[Jan]					Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W			
North					6.4700	10.6334		0.6300	0.7000		0.7700		21.0256 (74)			
Northeast					2.7000	11.2829		0.6300	0.7000		0.7700		9.3102 (75)			
East					4.9900	19.6403		0.6300	0.7000		0.7700		29.9516 (76)			
South					14.2200	46.7521		0.6300	0.7000		0.7700		203.1759 (78)			
Northwest					2.7000	11.2829		0.6300	0.7000		0.7700		9.3102 (81)			
North					2.4000	15.6897		0.6300	0.7000		1.0000		14.9454 (82)			
Solar gains					287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600 (83)
Total gains					884.9627	1113.7222	1295.9563	1504.6407	1645.6439	1647.6772	1574.8418	1439.6890	1300.6612	1088.7687	909.6407	828.4006 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.4345	58.5614	58.6862	59.2798	59.3922	59.9210	59.9210	60.0200	59.7162	59.3922	59.1652	58.9298
alpha	4.8956	4.9041	4.9124	4.9520	4.9595	4.9947	4.9947	5.0013	4.9811	4.9595	4.9443	4.9287
util living area	0.9974	0.9917	0.9765	0.9222	0.7949	0.6017	0.4454	0.5047	0.7630	0.9567	0.9934	0.9981 (86)
MIT	19.5633	19.8130	20.1419	20.5524	20.8438	20.9696	20.9944	20.9899	20.9054	20.5015	19.9525	19.5231 (87)
Th 2	19.9772	19.9791	19.9811	19.9903	19.9920	20.0000	20.0000	20.0014	19.9969	19.9920	19.9885	19.9849 (88)
util rest of house	0.9966	0.9891	0.9690	0.8980	0.7398	0.5174	0.3466	0.3998	0.6835	0.9381	0.9909	0.9975 (89)
MIT 2	18.6693	18.9188	19.2440	19.6410	19.8919	19.9867	19.9986	19.9986	19.9475	19.6038	19.0660	18.6351 (90)
Living area fraction	18.7800	19.0296	19.3552	19.7539	20.0098	20.1084	20.1219	20.1214	20.0662	19.7150	19.1758	18.7451 (91)
MIT	18.7800	19.0296	19.3552	19.7539	20.0098	20.1084	20.1219	20.1214	20.0662	19.7150	19.1758	18.7451 (92)
Temperature adjustment	18.7800	19.0296	19.3552	19.7539	20.0098	20.1084	20.1219	20.1214	20.0662	19.7150	19.1758	18.7451 (93)
adjusted MIT	18.7800	19.0296	19.3552	19.7539	20.0098	20.1084	20.1219	20.1214	20.0662	19.7150	19.1758	18.7451 (93)

8. Space heating requirement

Full SAP Calculation Printout



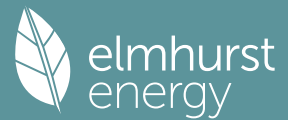
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9951	0.9858	0.9630	0.8913	0.7409	0.5270	0.3588	0.4127	0.6896	0.9315	0.9881	0.9964	(94)
Useful gains	880.6622	1097.9199	1248.0074	1341.0569	1219.1955	868.2519	565.1084	594.1185	896.9048	1014.2065	898.8043	825.4334	(95)
Ext temp.	4.3000	4.9000	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	2391.8620	2328.9205	2114.3664	1767.3169	1350.5127	887.3266	567.3272	598.4768	964.3633	1481.3721	1970.0927	2382.4232	(97)
Space heating kWh	1124.3327	827.2324	644.5711	306.9072	97.7000	0.0000	0.0000	0.0000	0.0000	347.5712	771.3276	1158.4004	(98a)
Space heating requirement - total per year (kWh/year)												5278.0426	
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	1124.3327	827.2324	644.5711	306.9072	97.7000	0.0000	0.0000	0.0000	0.0000	347.5712	771.3276	1158.4004	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5278.0426	
Space heating per m2										(98c) / (4) =		36.0768	(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	1514.2074	1192.0356	1222.2340	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9016	0.9481	0.9239	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1365.2613	1130.2280	1129.1993	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1832.0809	1752.0004	1603.1676	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	336.1101	462.5987	352.6324	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	84.0275	115.6497	88.1581	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												287.8353	(107)
Energy for space heating												36.0768	(99)
Energy for space cooling												1.9674	(108)
Total												38.0443	(109)
Fabric Energy Efficiency (TFEE)												38.0	(109)

Full SAP Calculation Printout



Property Reference	Plot 1	Issued on Date	13/11/2025
Assessment Reference	00001	Prop Type Ref	Plot 1
Property			
SAP Rating	81 B	DER	3.85
Environmental	96 A	% DER < TER	58.78
CO ₂ Emissions (t/year)	0.54	DFEE	37.13
Compliance Check	See BREL	% DFEE < TFEE	2.40
% DPER < TPER	17.38	DPER	40.23
Assessor Details	Mr. Matthew Stainrod	Assessor ID	AU83-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	62.9100 (1b)	x 2.5800 (2b)	= 162.3078 (1b) - (3b)
First floor	50.1400 (1c)	x 2.7500 (2c)	= 137.8850 (1c) - (3c)
Second floor	33.2500 (1d)	x 2.1500 (2d)	= 71.4875 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 371.6803 (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) =	0.1076 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0100	(17)
Infiltration rate	0.3581	(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) =	0.3044 (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	0.3881	0.3805	0.3729	0.3348	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577 (22b)
Effective ac	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640 (25)

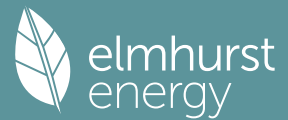
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1000	1.0000	2.1000		(26)
Window			31.0800	1.1450	35.5878		(27)
Roof Window			2.4000	1.1450	2.7481		(27a)
Ground Floor			62.9100	0.1300	8.1783	110.0000	6920.1000 (28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324	150.0000	14277.0000 (29a)
Stud wall to loft	12.4700		12.4700	0.0800	0.9976	9.0000	112.2300 (29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670	9.0000	118.3500 (29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286	9.0000	362.3400 (30)
Ceiling to loft space	16.9000		16.9000	0.0800	1.3520	9.0000	152.1000 (30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484	9.0000	93.9600 (30)
Total net area of external elements A _{um} (A, m ²)			286.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		76.0402		(33)
Main dwelling							
Party Wall			51.7400	0.0000	0.0000	70.0000	3621.8000 (32)
Block			74.0000			75.0000	5550.0000 (32c)
Stud			143.0000			9.0000	1287.0000 (32c)
First			50.1400			18.0000	902.5200 (32d)
Second			33.2500			18.0000	598.5000 (32d)

elmhurst
energy

[illegible]

Full SAP Calculation Printout



729.3638 746.6386 715.1057 689.0992 653.1896 628.8596 604.1056 605.1953 623.9373 645.9418 686.6318 713.6309 (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					6.4700	10.6334	0.6300	0.7000				0.7700			21.0256 (74)
Northeast					2.7000	11.2829	0.6300	0.7000				0.7700			9.3102 (75)
East					4.9900	19.6403	0.6300	0.7000				0.7700			29.9516 (76)
South					14.2200	46.7521	0.6300	0.7000				0.7700			203.1759 (78)
Northwest					2.7000	11.2829	0.6300	0.7000				0.7700			9.3102 (81)
North					2.4000	15.6897	0.6300	0.7000				1.0000			14.9454 (82)

Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600 (83)			
Total gains	1017.0826	1244.0965	1422.2841	1621.1873	1756.4313	1752.3747	1675.3749	1543.0019	1407.3275	1202.2201	1032.4252	959.1910 (84)			

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.3650	59.4963	59.6255	60.2401	60.3565	60.9043	60.9043	61.0068	60.6921	60.3565	60.1215	59.8778
alpha	4.9577	4.9664	4.9750	5.0160	5.0238	5.0603	5.0603	5.0671	5.0461	5.0238	5.0081	4.9919
util living area	0.9952	0.9867	0.9657	0.8987	0.7579	0.5629	0.4133	0.4661	0.7168	0.9368	0.9886	0.9964 (86)
Living	19.6912	19.9356	20.2510	20.6286	20.8796	20.9785	20.9963	20.9933	20.9316	20.5859	20.0669	19.6508
Non living	18.8076	19.0508	19.3602	19.7204	19.9311	20.0053	20.0136	20.0142	19.9769	19.6920	19.1899	18.7735
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	20.3305	19.9356	20.2510	20.6286	20.8796	20.9785	20.9963	20.9933	20.9316	20.5859	20.0669	19.8395 (87)
Th 2	19.9916	19.9936	19.9955	20.0047	20.0065	20.0145	20.0145	20.0160	20.0114	20.0065	20.0030	19.9993 (88)
util rest of house	0.9937	0.9827	0.9553	0.8700	0.7007	0.4829	0.3223	0.3692	0.6363	0.9121	0.9844	0.9952 (89)
MIT 2	19.3859	19.0508	19.3602	19.7204	19.9311	20.0053	20.0136	20.0142	19.9769	19.6920	19.1899	18.9450 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.5029	19.1604	19.4705	19.8329	20.0486	20.1258	20.1353	20.1354	20.0952	19.8027	19.2985	19.0558 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5029	19.1604	19.4705	19.8329	20.0486	20.1258	20.1353	20.1354	20.0952	19.8027	19.2985	19.0558 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9928	0.9782	0.9485	0.8643	0.7033	0.4922	0.3336	0.3812	0.6437	0.9059	0.9804	0.9937 (94)
Useful gains	1009.7158	1217.0247	1349.0671	1401.2462	1235.2413	862.4607	558.8281	588.1903	905.8327	1089.0685	1012.2224	953.1942 (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	2471.9032	2313.5492	2099.7204	1751.8066	1335.1314	875.7568	560.2903	591.0175	953.4682	1471.7323	1958.4581	2394.7813 (97)
Space heating kWh	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98a)
Space heating requirement - total per year (kWh/year)	4748.4721											
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	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4748.4721											
Space heating per m2	(98c) / (4) = 32.4571 (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 %)	277.9600 (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	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98)
Space heating efficiency (main heating system 1)	277.9600	277.9600	277.9600	277.9600	277.9600	0.0000	0.0000	0.0000	0.0000	277.9600	277.9600	277.9600 (210)
Space heating fuel (main heating system)	391.3755	265.0973	200.9232	90.8057	26.7370	0.0000	0.0000	0.0000	0.0000	102.4255	245.1035	385.8615 (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	337.1949	298.2746	316.4600	276.5643	267.0991	239.5371	235.2823	245.0690	248.3062	278.3051	297.7604	333.2356 (64)
Efficiency of water heater (217)m	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613 (216)
Fuel for water heating, kWh/month	180.9361	160.0518	169.8099	148.4022	143.3233	128.5337	126.2506	131.5021	133.2391	149.3363	159.7759	178.8116 (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	35.0093	28.0858	25.2881	18.5272	14.3109	11.6921	13.0549	16.9692	22.0414	28.9195	32.6645	35.9823 (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)

Full SAP Calculation Printout



Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1708.3292	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													186.3613	
Water heating fuel used													1809.9725	(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)													282.5451	(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													3800.8468	(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	1708.3292	0.1565	267.3014	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1809.9725	0.1410	255.2254	(264)
Space and water heating			522.5269	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	282.5451	0.1443	40.7800	(268)
Total CO2, kg/year			563.3069	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1708.3292	1.5792	2697.8628	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1809.9725	1.5214	2753.7138	(278)
Space and water heating			5451.5766	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	282.5451	1.5338	433.3772	(282)
Total Primary energy kWh/year			5884.9538	(286)
Dwelling Primary energy Rate (DPER)			40.2300	(287)

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

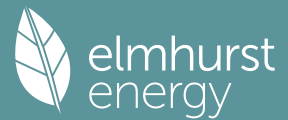
1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	62.9100 (1b)	x	2.5800 (2b)	=	162.3078 (1b) - (3b)	
First floor	50.1400 (1c)	x	2.7500 (2c)	=	137.8850 (1c) - (3c)	
Second floor	33.2500 (1d)	x	2.1500 (2d)	=	71.4875 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	371.6803 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		

Full SAP Calculation Printout



Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1076 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3576 (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) =	0.3040 (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	0.3876	0.3800	0.3724	0.3344	0.3268	0.2888	0.2888	0.2812	0.3040	0.3268	0.3420	0.3572	(22b)
	0.5751	0.5722	0.5693	0.5559	0.5534	0.5417	0.5417	0.5395	0.5462	0.5534	0.5585	0.5638	(25)

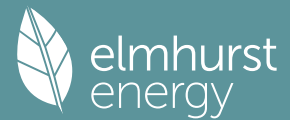
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			31.0800	1.1450	35.5878			(27)
TER Roof Window			2.4000	1.1450	3.6090			(27a)
Ground Floor			62.9100	0.1300	8.1783			(28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324			(29a)
Stud wall to loft	12.4700		12.4700	0.1800	2.2446			(29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670			(29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286			(30)
Ceiling to loft space	16.9000		16.9000	0.1100	1.8590			(30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484			(30)
Total net area of external elements Aum(A, m2)			286.8900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.6551			(33)
Main dwelling								
Party Wall			51.7400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.5171	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				19.2800	0.0500	0.9640		
E3 Sill				14.6000	0.0500	0.7300		
E3 Sill				47.3000	0.0500	2.3650		
E5 Ground floor (normal)				23.2500	0.1600	3.7200		
E6 Intermediate floor within a dwelling				19.2000	0.0000	0.0000		
E11 Eaves (insulation at rafter level)				20.9000	0.0400	0.8360		
E13 Gable (insulation at rafter level)				11.1100	0.0800	0.8888		
E16 Corner (normal)				24.9100	0.0900	2.2419		
E17 Corner (inverted - internal area greater than external area)				10.5000	-0.0900	-0.9450		
P1 Party wall - Ground floor				9.0700	0.0800	0.7256		
P2 Party wall - Intermediate floor within a dwelling				11.7400	0.0000	0.0000		
P5 Party wall - Roof (insulation at rafter level)				11.1100	0.0800	0.8888		
R1 Head of roof window				4.2000	0.0800	0.3360		
R2 Sill of roof window				4.2000	0.0600	0.2520		
R3 Jamb of roof window				8.4000	0.0800	0.6720		
R4 Ridge (vaulted ceiling)				6.7200	0.0800	0.5376		
R5 Ridge (inverted)				6.7200	0.0400	0.2688		
R6 Flat ceiling				9.5600	0.0600	0.5736		
R8 Roof to wall (rafter)				5.9000	0.0600	0.3540		
E18 Party wall between dwellings				9.6700	0.0600	0.5802		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9893	(36)
Point Thermal Bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	94.6444	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9282 (42)
Hot water usage for mixer showers	73.3168	72.2150	70.6095	67.5375	65.2705	62.7424	61.3054	62.8988	64.6454	67.3599	70.4978	73.0359 (42a)
Hot water usage for baths	31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449 (42b)
Hot water usage for other uses	44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181 (42c)
Average daily hot water use (litres/day)												137.5039 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	149.5868	146.3925	142.5025	136.5875	131.7841	126.6201	124.6357	128.5089	132.5938	138.0151	144.0212	149.1989 (44)
Energy conte	236.9090	208.4609	219.0210	186.9815	177.4067	155.6942	150.7361	159.1209	163.5014	187.2852	205.1845	233.6095 (45)
Energy content (annual)	Total = Sum(45)m =											2283.9108
Distribution loss (46)m = 0.15 x (45)m												
	35.5363	31.2691	32.8532	28.0472	26.6110	23.3541	22.6104	23.8681	24.5252	28.0928	30.7777	35.0414 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)

Full SAP Calculation Printout



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	287.8351	254.4587	269.9471	236.2648	228.3328	204.9775	201.6621	210.0469	212.7847	238.2112	254.4678	284.5355 (62)
WWHRS	-33.5174	-29.6431	-31.0405	-25.7028	-23.9541	-20.4977	-19.2133	-20.4314	-21.2077	-25.0015	-28.3237	-32.8967 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	254.3177	224.8156	238.9066	210.5620	204.3788	184.4798	182.4489	189.6155	191.5770	213.2097	226.1442	251.6388 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2572.0946 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	119.5131	106.1115	113.5653	101.5980	99.7286	91.1949	90.8606	93.6485	93.7908	103.0132	107.6505	118.4160 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	159.6219	176.7243	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219	164.9426	159.6219	164.9426	159.6219	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.4683	319.7522	311.4768	293.8593	271.6205	250.7191	236.7557	233.4717	241.7472	259.3646	281.6035	302.5049	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	(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)	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	(71)
Water heating gains (Table 5)	160.6359	157.9039	152.6416	141.1083	134.0438	126.6596	122.1245	125.8717	130.2651	138.4586	149.5146	159.1613	(72)
Total internal gains	706.6497	724.3041	693.6639	669.8339	635.2098	609.2450	585.4257	585.8890	603.8785	627.3687	665.9843	691.2117	(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					6.4700	10.6334		0.6300	0.7000	0.7700		21.0256 (74)	
Northeast					2.7000	11.2829		0.6300	0.7000	0.7700		9.3102 (75)	
East					4.9900	19.6403		0.6300	0.7000	0.7700		29.9516 (76)	
South					14.2200	46.7521		0.6300	0.7000	0.7700		203.1759 (78)	
Northwest					2.7000	11.2829		0.6300	0.7000	0.7700		9.3102 (81)	
North					2.4000	15.6897		0.6300	0.7000	1.0000		14.9454 (82)	

Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600 (83)	
Total gains	994.3685	1221.7620	1400.8424	1601.9220	1738.4516	1732.7601	1656.6950	1523.6955	1387.2687	1183.6471	1011.7777	936.7717 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil _m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.4345	58.5614	58.6862	59.2798	59.3922	59.9210	59.9210	60.0200	59.7162	59.3922	59.1652	58.9298
alpha	4.8956	4.9041	4.9124	4.9520	4.9595	4.9947	4.9947	5.0013	4.9811	4.9595	4.9443	4.9287
util living area	0.9957	0.9879	0.9684	0.9053	0.7691	0.5761	0.4243	0.4787	0.7310	0.9418	0.9897	0.9967 (86)
MIT	19.6455	19.8914	20.2117	20.6005	20.8660	20.9748	20.9955	20.9920	20.9222	20.5578	20.0275	19.6051 (87)
Th 2	19.9772	19.9791	19.9811	19.9903	19.9920	20.0000	20.0000	20.0014	19.9969	19.9920	19.9885	19.9849 (88)
util rest of house	0.9943	0.9841	0.9587	0.8776	0.7121	0.4939	0.3297	0.3782	0.6500	0.9185	0.9859	0.9957 (89)
MIT 2	18.4039	18.7176	19.1210	19.5961	19.8837	19.9860	19.9985	19.9986	19.9461	19.5588	18.8995	18.3577 (90)
Living area fraction	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (92)
MIT Temperature adjustment	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (93)
adjusted MIT	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (93)

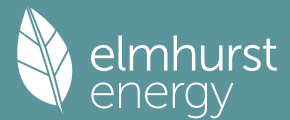
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9915	0.9785	0.9497	0.8690	0.7129	0.5031	0.3414	0.3906	0.6561	0.9094	0.9808	0.9934	(94)
Useful gains	985.8815	1195.4577	1330.3779	1392.0241	1239.3095	871.7605	565.5747	595.1113	910.2485	1076.4417	992.3108	930.6268	(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	2355.1298	2301.4670	2098.0670	1761.8782	1349.7967	887.3436	567.3446	598.5182	964.4928	1476.0953	1947.8034	2344.2700	(97)
Space heating kWh	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506	(98a)
Space heating requirement - total per year (kWh/year)												4718.6647	
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	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4718.6647	
Space heating per m2	(98c) / (4) =											32.2533	(99)

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

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

Full SAP Calculation Printout



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	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506	(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)	1103.7062	805.2419	618.8090	288.5102	89.0601	0.0000	0.0000	0.0000	0.0000	322.1477	745.3464	1139.4914	(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	254.3177	224.8156	238.9066	210.5620	204.3788	184.4798	182.4489	189.6155	191.5770	213.2097	226.1442	251.6388	(64)
Efficiency of water heater	86.8434	86.5335	85.9414	84.5875	82.1894	79.8000	79.8000	79.8000	79.8000	84.8058	86.3896	86.9077	(216)
Fuel for water heating, kWh/month	292.8464	259.8018	277.9877	248.9280	248.6681	231.1777	228.6327	237.6135	240.0714	251.4094	261.7725	289.5474	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.1663	26.6072	23.9569	17.5518	13.5575	11.0766	12.3676	16.0759	20.8810	27.3970	30.9449	34.0881	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-57.0777	-79.5772	-113.1041	-125.6442	-134.1240	-124.5903	-122.9154	-116.6132	-105.4208	-90.1308	-62.3775	-49.4408	(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	-35.0349	-73.3598	-145.2289	-217.3430	-286.7027	-287.9315	-284.6714	-241.4568	-177.4593	-104.8070	-46.7308	-27.7423	(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												5112.3127	(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												3068.4565	(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)												267.6709	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3109.4844	(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												5424.9558	(238)

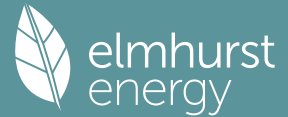
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5112.3127	0.2100	1073.5857	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3068.4565	0.2100	644.3759	(264)
Space and water heating			1717.9616	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	267.6709	0.1443	38.6332	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1181.0159	0.1349	-159.2645	
PV Unit electricity exported	-1928.4684	0.1260	-242.9710	
Total			-402.2355	(269)
Total CO2, kg/year			1366.2885	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5112.3127	1.1300	5776.9134	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3068.4565	1.1300	3467.3559	(278)
Space and water heating			9244.2693	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	267.6709	1.5338	410.5625	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1181.0159	1.4984	-1769.6486	
PV Unit electricity exported	-1928.4684	0.4625	-891.8774	
Total			-2661.5260	(283)
Total Primary energy kWh/year			7123.4067	(286)
Target Primary Energy Rate (TPER)			48.6900	(287)

Full SAP Calculation Printout



Property Reference	Plot 2				Issued on Date	13/11/2025	
Assessment Reference	00001			Prop Type Ref	Plot 2		
Property							
SAP Rating	81 B		DER	3.85		TER	9.34
Environmental	96 A		% DER < TER				58.78
CO ₂ Emissions (t/year)	0.54		DFEE	37.13		TFEE	38.04
Compliance Check	See BREL		% DFEE < TFEE				2.40
% DPER < TPER	17.38		DPER	40.23		TPER	48.69
Assessor Details	Mr. Matthew Stainrod					Assessor ID	AU83-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	62.9100 (1b)	x 2.5800 (2b)	= 162.3078 (1b) - (3b)
First floor	50.1400 (1c)	x 2.7500 (2c)	= 137.8850 (1c) - (3c)
Second floor	33.2500 (1d)	x 2.1500 (2d)	= 71.4875 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 371.6803 (5)

2. Ventilation rate

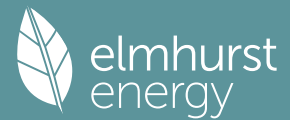
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1076 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0100	(17)
Infiltration rate	0.3581	(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) =	0.3044 (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	0.3881	0.3805	0.3729	0.3348	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577 (22b)
Effective ac	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1000	1.0000	2.1000		(26)
Window			31.0800	1.1450	35.5878		(27)
Roof Window			2.4000	1.1450	2.7481		(27a)
Ground Floor			62.9100	0.1300	8.1783	110.0000	6920.1000 (28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324	150.0000	14277.0000 (29a)
Stud wall to loft	12.4700		12.4700	0.0800	0.9976	9.0000	112.2300 (29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670	9.0000	118.3500 (29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286	9.0000	362.3400 (30)
Ceiling to loft space	16.9000		16.9000	0.0800	1.3520	9.0000	152.1000 (30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484	9.0000	93.9600 (30)
Total net area of external elements A _{um} (A, m ²)			286.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		76.0402		(33)
Main dwelling							
Party Wall			51.7400	0.0000	0.0000	70.0000	3621.8000 (32)
Block			74.0000			75.0000	5550.0000 (32c)
Stud			143.0000			9.0000	1287.0000 (32c)
First			50.1400			18.0000	902.5200 (32d)
Second			33.2500			18.0000	598.5000 (32d)

Full SAP Calculation Printout

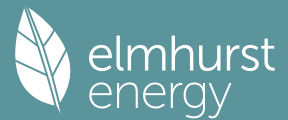


Ground	50.4000										9.0000	453.6000	(32e)	
First	33.2500										9.0000	299.2500	(32e)	
Heat capacity Cm = Sum(A x k)												(28)...(30) + (32) + (32a)...(32e) =	34748.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													237.5171	(35)
List of Thermal Bridges														
K1 Element											Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)											19.2800	0.0500	0.9640	
E3 Sill											14.6000	0.0500	0.7300	
E3 Sill											47.3000	0.0500	2.3650	
E5 Ground floor (normal)											23.2500	0.1600	3.7200	
E6 Intermediate floor within a dwelling											19.2000	0.0000	0.0000	
E11 Eaves (insulation at rafter level)											20.9000	0.0400	0.8360	
E13 Gable (insulation at rafter level)											11.1100	0.0800	0.8888	
E16 Corner (normal)											24.9100	0.0900	2.2419	
E17 Corner (inverted - internal area greater than external area)											10.5000	-0.0900	-0.9450	
P1 Party wall - Ground floor											9.0700	0.0800	0.7256	
P2 Party wall - Intermediate floor within a dwelling											11.7400	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)											11.1100	0.0800	0.8888	
R1 Head of roof window											4.2000	0.0800	0.3360	
R2 Sill of roof window											4.2000	0.0600	0.2520	
R3 Jamb of roof window											8.4000	0.0800	0.6720	
R4 Ridge (vaulted ceiling)											6.7200	0.0800	0.5376	
R5 Ridge (inverted)											6.7200	0.0400	0.2688	
R6 Flat ceiling											9.5600	0.0600	0.5736	
R8 Roof to wall (rafter)											5.9000	0.0600	0.3540	
E18 Party wall between dwellings											9.6700	0.0600	0.5802	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													15.9893	(36)
Point Thermal bridges													(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	92.0295	(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		
	70.5650	70.2063	69.8547	68.2032	67.8942	66.4558	66.4558	66.1894	67.0098	67.8942	68.5193	69.1728	(38)	
Heat transfer coeff	162.5945	162.2358	161.8842	160.2327	159.9237	158.4853	158.4853	158.2189	159.0393	159.9237	160.5488	161.2023	(39)	
Average = Sum(39)m / 12 =												160.2312		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP	1.1114	1.1089	1.1065	1.0952	1.0931	1.0833	1.0833	1.0815	1.0871	1.0931	1.0974	1.1019	(40)	
HLP (average)												1.0952		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31		

4. Water heating energy requirements (kWh/year)														

Assumed occupancy												2.9282	(42)	
Hot water usage for mixer showers														
	100.8107	99.2957	97.0880	92.8641	89.7470	86.2708	84.2949	86.4858	88.8875	92.6199	96.9345	100.4244	(42a)	
Hot water usage for baths														
	31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449	(42b)	
Hot water usage for other uses														
	44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181	(42c)	
Average daily hot water use (litres/day)												162.8523	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	177.0807	173.4731	168.9810	161.9141	156.2606	150.1485	147.6252	152.0959	156.8358	163.2750	170.4578	176.5874	(44)	
Energy conte	280.4525	247.0234	259.7176	221.6523	210.3567	184.6251	178.5399	188.3266	193.3942	221.5627	242.8484	276.4932	(45)	
Energy content (annual)											Total = Sum(45)m =	2704.9926		
Distribution loss (46)m = 0.15 x (45)m	42.0679	37.0535	38.9576	33.2478	31.5535	27.6938	26.7810	28.2490	29.0091	33.2344	36.4273	41.4740	(46)	
Water storage loss:														
Store volume												200.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												2.0000	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												1.0800	(55)	
Total storage loss														
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)	
If cylinder contains dedicated solar storage														
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(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														
	337.1949	298.2746	316.4600	276.5643	267.0991	239.5371	235.2823	245.0690	248.3062	278.3051	297.7604	333.2356	(62)	
WHHRS	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														
	337.1949	298.2746	316.4600	276.5643	267.0991	239.5371	235.2823	245.0690	248.3062	278.3051	297.7604	333.2356	(64)	
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m =	3373.0886	(64)
Electric shower(s)												3373	(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														
	138.6444	123.1362	131.7500	117.6290	115.3375	105.3174	104.7584	108.0125	108.2332	119.0635	124.6767	137.3279	(65)	

Full SAP Calculation Printout



729.3638 746.6386 715.1057 689.0992 653.1896 628.8596 604.1056 605.1953 623.9373 645.9418 686.6318 713.6309 (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					6.4700	10.6334	0.6300	0.7000				0.7700			21.0256 (74)
Northeast					2.7000	11.2829	0.6300	0.7000				0.7700			9.3102 (75)
South					14.2200	46.7521	0.6300	0.7000				0.7700			203.1759 (78)
West					4.9900	19.6403	0.6300	0.7000				0.7700			29.9516 (80)
Northwest					2.7000	11.2829	0.6300	0.7000				0.7700			9.3102 (81)
North					2.4000	15.6897	0.6300	0.7000				1.0000			14.9454 (82)

Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600			(83)
Total gains	1017.0826	1244.0965	1422.2841	1621.1873	1756.4313	1752.3747	1675.3749	1543.0019	1407.3275	1202.2201	1032.4252	959.1910			(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.3650	59.4963	59.6255	60.2401	60.3565	60.9043	60.9043	61.0068	60.6921	60.3565	60.1215	59.8778
alpha	4.9577	4.9664	4.9750	5.0160	5.0238	5.0603	5.0603	5.0671	5.0461	5.0238	5.0081	4.9919
util living area	0.9952	0.9867	0.9657	0.8987	0.7579	0.5629	0.4133	0.4661	0.7168	0.9368	0.9886	0.9964 (86)
Living	19.6912	19.9356	20.2510	20.6286	20.8796	20.9785	20.9963	20.9933	20.9316	20.5859	20.0669	19.6508
Non living	18.8076	19.0508	19.3602	19.7204	19.9311	20.0053	20.0136	20.0142	19.9769	19.6920	19.1899	18.7735
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	20.3305	19.9356	20.2510	20.6286	20.8796	20.9785	20.9963	20.9933	20.9316	20.5859	20.0669	19.8395 (87)
Th 2	19.9916	19.9936	19.9955	20.0047	20.0065	20.0145	20.0145	20.0160	20.0114	20.0065	20.0030	19.9993 (88)
util rest of house	0.9937	0.9827	0.9553	0.8700	0.7007	0.4829	0.3223	0.3692	0.6363	0.9121	0.9844	0.9952 (89)
MIT 2	19.3859	19.0508	19.3602	19.7204	19.9311	20.0053	20.0136	20.0142	19.9769	19.6920	19.1899	18.9450 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.5029	19.1604	19.4705	19.8329	20.0486	20.1258	20.1353	20.1354	20.0952	19.8027	19.2985	19.0558 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5029	19.1604	19.4705	19.8329	20.0486	20.1258	20.1353	20.1354	20.0952	19.8027	19.2985	19.0558 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9928	0.9782	0.9485	0.8643	0.7033	0.4922	0.3336	0.3812	0.6437	0.9059	0.9804	0.9937 (94)
Useful gains	1009.7158	1217.0247	1349.0671	1401.2462	1235.2413	862.4607	558.8281	588.1903	905.8327	1089.0685	1012.2224	953.1942 (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	2471.9032	2313.5492	2099.7204	1751.8066	1335.1314	875.7568	560.2903	591.0175	953.4682	1471.7323	1958.4581	2394.7813 (97)
Space heating kWh	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98a)
Space heating requirement - total per year (kWh/year)	4748.4721											
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	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4748.4721											
Space heating per m2	(98c) / (4) = 32.4571 (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 %)	277.9600 (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	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98)
Space heating efficiency (main heating system 1)	277.9600	277.9600	277.9600	277.9600	277.9600	0.0000	0.0000	0.0000	0.0000	277.9600	277.9600	277.9600 (210)
Space heating fuel (main heating system)	391.3755	265.0973	200.9232	90.8057	26.7370	0.0000	0.0000	0.0000	0.0000	102.4255	245.1035	385.8615 (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	337.1949	298.2746	316.4600	276.5643	267.0991	239.5371	235.2823	245.0690	248.3062	278.3051	297.7604	333.2356 (64)
Efficiency of water heater (217)m	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613 (216)
Fuel for water heating, kWh/month	180.9361	160.0518	169.8099	148.4022	143.3233	128.5337	126.2506	131.5021	133.2391	149.3363	159.7759	178.8116 (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	35.0093	28.0858	25.2881	18.5272	14.3109	11.6921	13.0549	16.9692	22.0414	28.9195	32.6645	35.9823 (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)

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	1708.3292	0.1565	267.3014 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1809.9725	0.1410	255.2254 (264)
Space and water heating			522.5269 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	282.5451	0.1443	40.7800 (268)
Total CO ₂ , kg/year			563.3069 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500 (273)

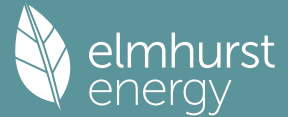
13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1708.3292	1.5792	2697.8628 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1809.9725	1.5214	2753.7138 (278)
Space and water heating			5451.5766 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	282.5451	1.5338	433.3772 (282)
Total Primary energy kWh/year			5884.9538 (286)
Dwelling Primary energy rate (DPER)			40.2300 (287)

1. Overall dwelling characteristics

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

Full SAP Calculation Printout



Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1076 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3576 (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) =	0.3040 (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 infiltr 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	0.3876	0.3800	0.3724	0.3344	0.3268	0.2888	0.2888	0.2812	0.3040	0.3268	0.3420	0.3572	(22b)
	0.5751	0.5722	0.5693	0.5559	0.5534	0.5417	0.5417	0.5395	0.5462	0.5534	0.5585	0.5638	(25)

3. Heat losses and heat loss parameter

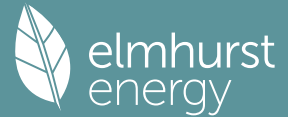
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			31.0800	1.1450	35.5878			(27)
TER Roof Window			2.4000	1.1450	3.6090			(27a)
Ground Floor			62.9100	0.1300	8.1783			(28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324			(29a)
Stud wall to loft	12.4700		12.4700	0.1800	2.2446			(29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670			(29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286			(30)
Ceiling to loft space	16.9000		16.9000	0.1100	1.8590			(30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484			(30)
Total net area of external elements Aum(A, m2)			286.8900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.6551			(33)
Main dwelling								
Party Wall			51.7400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.5171	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				19.2800	0.0500	0.9640		
E3 Sill				14.6000	0.0500	0.7300		
E3 Sill				47.3000	0.0500	2.3650		
E5 Ground floor (normal)				23.2500	0.1600	3.7200		
E6 Intermediate floor within a dwelling				19.2000	0.0000	0.0000		
E11 Eaves (insulation at rafter level)				20.9000	0.0400	0.8360		
E13 Gable (insulation at rafter level)				11.1100	0.0800	0.8888		
E16 Corner (normal)				24.9100	0.0900	2.2419		
E17 Corner (inverted - internal area greater than external area)				10.5000	-0.0900	-0.9450		
P1 Party wall - Ground floor				9.0700	0.0800	0.7256		
P2 Party wall - Intermediate floor within a dwelling				11.7400	0.0000	0.0000		
P5 Party wall - Roof (insulation at rafter level)				11.1100	0.0800	0.8888		
R1 Head of roof window				4.2000	0.0800	0.3360		
R2 Sill of roof window				4.2000	0.0600	0.2520		
R3 Jamb of roof window				8.4000	0.0800	0.6720		
R4 Ridge (vaulted ceiling)				6.7200	0.0800	0.5376		
R5 Ridge (inverted)				6.7200	0.0400	0.2688		
R6 Flat ceiling				9.5600	0.0600	0.5736		
R8 Roof to wall (rafter)				5.9000	0.0600	0.3540		
E18 Party wall between dwellings				9.6700	0.0600	0.5802		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9893	(36)
Point Thermal Bridges							0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	94.6444	(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	70.5392	70.1815	69.8309	68.1840	67.8759	66.4415	66.4415	66.1759	66.9940	67.8759	68.4992	69.1509	(38)
Average = Sum(39)m / 12 =	165.1837	164.8259	164.4753	162.8284	162.5203	161.0859	161.0859	160.8203	161.6384	162.5203	163.1436	163.7953	(39)
												162.8269	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1291	1.1266	1.1242	1.1130	1.1109	1.1011	1.1011	1.0992	1.1048	1.1109	1.1151	1.1196	(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													2.9282 (42)
Hot water usage for mixer showers													
	73.3168	72.2150	70.6095	67.5375	65.2705	62.7424	61.3054	62.8988	64.6454	67.3599	70.4978	73.0359	(42a)
Hot water usage for baths													
	31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449	(42b)
Hot water usage for other uses													
	44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181	(42c)
Average daily hot water use (litres/day)													137.5039 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.5868	146.3925	142.5025	136.5875	131.7841	126.6201	124.6357	128.5089	132.5938	138.0151	144.0212	149.1989	(44)
Energy content (annual)	236.9090	208.4609	219.0210	186.9815	177.4067	155.6942	150.7361	159.1209	163.5014	187.2852	205.1845	233.6095	(45)
Distribution loss (46)m = 0.15 x (45)m													
	35.5363	31.2691	32.8532	28.0472	26.6110	23.3541	22.6104	23.8681	24.5252	28.0928	30.7777	35.0414	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)

Full SAP Calculation Printout



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													
	287.8351	254.4587	269.9471	236.2648	228.3328	204.9775	201.6621	210.0469	212.7847	238.2112	254.4678	284.5355 (62)	
WWHRS	-33.5174	-29.6431	-31.0405	-25.7028	-23.9541	-20.4977	-19.2133	-20.4314	-21.2077	-25.0015	-28.3237	-32.8967 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h													
	254.3177	224.8156	238.9066	210.5620	204.3788	184.4798	182.4489	189.6155	191.5770	213.2097	226.1442	251.6388 (64)	
										Total per year (kWh/year) = Sum(64)m =			2572.0946 (64)
													2572 (64)
12Total per year (kWh/year)													
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000 (64a)
Heat gains from water heating, kWh/month													
	119.5131	106.1115	113.5653	101.5980	99.7286	91.1949	90.8606	93.6485	93.7908	103.0132	107.6505	118.4160 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	159.6219	176.7243	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219	164.9426	159.6219	164.9426	159.6219 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	316.4683	319.7522	311.4768	293.8593	271.6205	250.7191	236.7557	233.4717	241.7472	259.3646	281.6035	302.5049 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412 (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)												
	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297 (71)
Water heating gains (Table 5)												
	160.6359	157.9039	152.6416	141.1083	134.0438	126.6596	122.1245	125.8717	130.2651	138.4586	149.5146	159.1613 (72)
Total internal gains												
	706.6497	724.3041	693.6639	669.8339	635.2098	609.2450	585.4257	585.8890	603.8785	627.3687	665.9843	691.2117 (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				6.4700	10.6334		0.6300		0.7000		0.7700		21.0256 (74)
Northeast				2.7000	11.2829		0.6300		0.7000		0.7700		9.3102 (75)
South				14.2200	46.7521		0.6300		0.7000		0.7700		203.1759 (78)
West				4.9900	19.6403		0.6300		0.7000		0.7700		29.9516 (80)
Northwest				2.7000	11.2829		0.6300		0.7000		0.7700		9.3102 (81)
North				2.4000	15.6897		0.6300		0.7000		1.0000		14.9454 (82)
Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600	(83)
Total gains	994.3685	1221.7620	1400.8424	1601.9220	1738.4516	1732.7601	1656.6950	1523.6955	1387.2687	1183.6471	1011.7777	936.7717	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.4345	58.5614	58.6862	59.2798	59.3922	59.9210	59.9210	60.0200	59.7162	59.3922	59.1652	58.9298
alpha	4.8956	4.9041	4.9124	4.9250	4.9595	4.9947	4.9947	5.0013	4.9811	4.9595	4.9443	4.9287
util living area												
	0.9957	0.9879	0.9684	0.9053	0.7691	0.5761	0.4243	0.4787	0.7310	0.9418	0.9897	0.9967 (86)
MIT	19.6455	19.8914	20.2117	20.6005	20.8660	20.9748	20.9955	20.9920	20.9222	20.5578	20.0275	19.6051 (87)
Th 2	19.9772	19.9791	19.9811	19.9903	19.9920	20.0000	20.0000	20.0014	19.9969	19.9920	19.9885	19.9849 (88)
util rest of house												
	0.9943	0.9841	0.9587	0.8776	0.7121	0.4939	0.3297	0.3782	0.6500	0.9185	0.9859	0.9957 (89)
MIT 2	18.4039	18.7176	19.1210	19.5961	19.8837	19.9860	19.9985	19.9986	19.9461	19.5588	18.8995	18.3577 (90)
Living area fraction												fLA = Living area / (4) =
	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (91)
MIT												
	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (92)
Temperature adjustment												
	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (93)

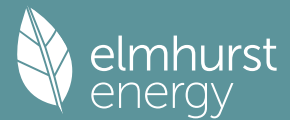
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9915	0.9785	0.9497	0.8690	0.7129	0.5031	0.3414	0.3906	0.6561	0.9094	0.9808	0.9934 (94)
Useful gains	985.8815	1195.4577	1330.3779	1392.0241	1239.3095	871.7605	565.5747	595.1113	910.2485	1076.4417	992.3108	930.6268 (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												
	2355.1298	2301.4670	2098.0670	1761.8782	1349.7967	887.3436	567.3446	598.5182	964.4928	1476.0953	1947.8034	2344.2700 (97)
Space heating kWh												
	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506 (98a)
Space heating requirement - total per year (kWh/year)												
	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	4718.6647
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)												
	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4718.6647
Space heating per m ²												(98c) / (4) =
												32.2533 (99)

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

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

Full SAP Calculation Printout



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	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506	(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)	1103.7062	805.2419	618.8090	288.5102	89.0601	0.0000	0.0000	0.0000	0.0000	322.1477	745.3464	1139.4914	(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	254.3177	224.8156	238.9066	210.5620	204.3788	184.4798	182.4489	189.6155	191.5770	213.2097	226.1442	251.6388	(64)
Efficiency of water heater	86.8434	86.5335	85.9414	84.5875	82.1894	79.8000	79.8000	79.8000	79.8000	84.8058	86.3896	86.9077	(216)
Fuel for water heating, kWh/month	292.8464	259.8018	277.9877	248.9280	248.6681	231.1777	228.6327	237.6135	240.0714	251.4094	261.7725	289.5474	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.1663	26.6072	23.9569	17.5518	13.5575	11.0766	12.3676	16.0759	20.8810	27.3970	30.9449	34.0881	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-57.0777	-79.5772	-113.1041	-125.6442	-134.1240	-124.5903	-122.9154	-116.6132	-105.4208	-90.1308	-62.3775	-49.4408	(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	-35.0349	-73.3598	-145.2289	-217.3430	-286.7027	-287.9315	-284.6714	-241.4568	-177.4593	-104.8070	-46.7308	-27.7423	(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												5112.3127	(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												3068.4565	(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)												267.6709	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3109.4844	(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												5424.9558	(238)

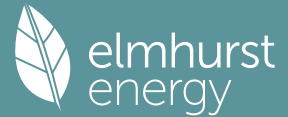
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5112.3127	0.2100	1073.5857	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3068.4565	0.2100	644.3759	(264)
Space and water heating			1717.9616	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	267.6709	0.1443	38.6332	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1181.0159	0.1349	-159.2645	
PV Unit electricity exported	-1928.4684	0.1260	-242.9710	
Total			-402.2355	(269)
Total CO2, kg/year			1366.2885	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5112.3127	1.1300	5776.9134	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3068.4565	1.1300	3467.3559	(278)
Space and water heating			9244.2693	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	267.6709	1.5338	410.5625	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1181.0159	1.4984	-1769.6486	
PV Unit electricity exported	-1928.4684	0.4625	-891.8774	
Total			-2661.5260	(283)
Total Primary energy kWh/year			7123.4067	(286)
Target Primary Energy Rate (TPER)			48.6900	(287)

Full SAP Calculation Printout



Property Reference	Plot 2	Issued on Date	13/11/2025
Assessment Reference	00001	Prop Type Ref	Plot 2
Property			
SAP Rating	81 B	DER	3.85
Environmental	96 A	% DER < TER	58.78
CO ₂ Emissions (t/year)	0.54	DFEE	37.13
Compliance Check	See BREL	% DFEE < TFEE	2.40
% DPER < TPER	17.38	DPER	40.23
Assessor Details	Mr. Matthew Stainrod	Assessor ID	AU83-0001
Client			

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)
Main dwelling			
Ground floor	62.9100 (1b)	x 2.5800 (2b)	= 162.3078 (1b) - (3b)
First floor	50.1400 (1c)	x 2.7500 (2c)	= 137.8850 (1c) - (3c)
Second floor	33.2500 (1d)	x 2.1500 (2d)	= 71.4875 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	371.6803 (5)

2. Ventilation rate

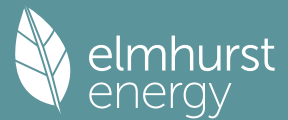
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1076 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0100	(17)
Infiltration rate	0.3581	(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) =	0.3044 (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	0.3881	0.3805	0.3729	0.3348	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577 (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	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1000	1.0000	2.1000		(26)
Window			31.0800	1.1450	35.5878		(27)
Roof Window			2.4000	1.1450	2.7481		(27a)
Ground Floor			62.9100	0.1300	8.1783	110.0000	6920.1000 (28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324	150.0000	14277.0000 (29a)
Stud wall to loft	12.4700		12.4700	0.0800	0.9976	9.0000	112.2300 (29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670	9.0000	118.3500 (29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286	9.0000	362.3400 (30)
Ceiling to loft space	16.9000		16.9000	0.0800	1.3520	9.0000	152.1000 (30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484	9.0000	93.9600 (30)
Total net area of external elements A _{um} (A, m ²)			286.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	76.0402		(33)
Main dwelling							
Party Wall			51.7400	0.0000	0.0000	70.0000	3621.8000 (32)
Block			74.0000			75.0000	5550.0000 (32c)
Stud			143.0000			9.0000	1287.0000 (32c)

Full SAP Calculation Printout



First	50.1400	18.0000	902.5200 (32d)
Second	33.2500	18.0000	598.5000 (32d)
Ground	50.4000	9.0000	453.6000 (32e)
First	33.2500	9.0000	299.2500 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 34748.7500 (34)

Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ 237.5171 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	19.2800	0.0500	0.9640
E2 Other lintels (including other steel lintels)	14.6000	0.0500	0.7300
E3 Sill	47.3000	0.0500	2.3650
E3 Sill	23.2500	0.1600	3.7200
E5 Ground floor (normal)	19.2000	0.0000	0.0000
E6 Intermediate floor within a dwelling	20.9000	0.0400	0.8360
E11 Eaves (insulation at rafter level)	11.1100	0.0800	0.8888
E13 Gable (insulation at rafter level)	24.9100	0.0900	2.2419
E16 Corner (normal)	10.5000	-0.0900	-0.9450
E17 Corner (inverted - internal area greater than external area)	9.0700	0.0800	0.7256
P1 Party wall - Ground floor	11.7400	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	11.1100	0.0800	0.8888
P5 Party wall - Roof (insulation at rafter level)	4.2000	0.0800	0.3360
R1 Head of roof window	4.2000	0.0600	0.2520
R2 Sill of roof window	8.4000	0.0800	0.6720
R3 Jamb of roof window	6.7200	0.0800	0.5376
R4 Ridge (vaulted ceiling)	6.7200	0.0400	0.2688
R5 Ridge (inverted)	9.5600	0.0600	0.5736
R6 Flat ceiling	5.9000	0.0600	0.3540
R8 Roof to wall (rafter)	9.6700	0.0600	0.5802
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.9893 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			92.0295 (37) (33) + (36) + (36a) =

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	70.5650	70.2063	69.8547	68.2032	67.8942	66.4558	66.4558	66.1894	67.0098	67.8942	68.5193	69.1728 (38)
Heat transfer coeff	162.5945	162.2358	161.8842	160.2327	159.9237	158.4853	158.4853	158.2189	159.0393	159.9237	160.5488	161.2023 (39)
Average = $\text{Sum}(39)\text{m} / 12 =$												160.2312
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1114	1.1089	1.1065	1.0952	1.0931	1.0833	1.0833	1.0815	1.0871	1.0931	1.0974	1.1019 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9282 (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												
31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449	31.5449 (42b)
Hot water usage for other uses												
44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181	44.6181 (42c)
Average daily hot water use (litres/day)												69.9082 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
76.2700	74.1774	71.8930	69.0500	66.5136	63.8777	63.3303	65.6101	67.9483	70.6552	73.5233	76.1630	76.1630 (44)
Energy conte	120.7930	105.6277	110.4969	94.5260	89.5401	78.5451	76.5925	81.2390	83.7871	95.8784	104.7474	119.2528 (45)
Energy content (annual)												
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
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												
102.6741	89.7835	93.9223	80.3471	76.1091	66.7633	65.1036	69.0532	71.2190	81.4966	89.0353	101.3649	101.3649 (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	102.6741	89.7835	93.9223	80.3471	76.1091	66.7633	65.1036	69.0532	71.2190	81.4966	89.0353	101.3649 (64)
12Total per year (kWh/year)												
Electric shower(s)	58.7146	52.3152	57.1262	54.5148	55.5377	52.9776	54.7435	55.5377	54.5148	57.1262	56.0520	58.7146 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = $\text{Sum}(64a)\text{m} =$												667.8748 (64a)
Heat gains from water heating, kWh/month												
40.3472	35.5247	37.7621	33.7155	32.9117	29.9352	29.9618	31.1477	31.4334	34.6557	36.2718	40.0199	40.0199 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
159.6219	176.7243	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
316.4683	319.7522	311.4768	293.8593	271.6205	250.7191	236.7557	233.4717	241.7472	259.3646	281.6035	302.5049	302.5049 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297 (71)
Water heating gains (Table 5)												
54.2301	52.8641	50.7555	46.8270	44.2362	41.5767	40.2712	41.8652	43.6576	46.5802	50.3775	53.7901	53.7901 (72)
Total internal gains	597.2439	616.2642	588.7779	572.5527	542.4022	524.1621	503.5724	501.8825	517.2710	532.4904	563.8473	582.8406 (73)

Full SAP Calculation Printout



6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W
North					6.4700	10.6334	0.6300	0.7000				0.7700	21.0256 (74)
Northeast					2.7000	11.2829	0.6300	0.7000				0.7700	9.3102 (75)
South					14.2200	46.7521	0.6300	0.7000				0.7700	203.1759 (78)
West					4.9900	19.6403	0.6300	0.7000				0.7700	29.9516 (80)
Northwest					2.7000	11.2829	0.6300	0.7000				0.7700	9.3102 (81)
North					2.4000	15.6897	0.6300	0.7000				1.0000	14.9454 (82)
Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600	(83)
Total gains	884.9627	1113.7222	1295.9563	1504.6407	1645.6439	1647.6772	1574.8418	1439.6890	1300.6612	1088.7687	909.6407	828.4006	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.3650	59.4963	59.6255	60.2401	60.3565	60.9043	60.9043	61.0068	60.6921	60.3565	60.1215	59.8778
alpha	4.9577	4.9664	4.9750	5.0160	5.0238	5.0603	5.0603	5.0671	5.0461	5.0238	5.0081	4.9919
util living area	0.9974	0.9916	0.9760	0.9198	0.7891	0.5941	0.4388	0.4975	0.7566	0.9554	0.9934	0.9981 (86)
MIT	19.5917	19.8409	20.1674	20.5723	20.8545	20.9727	20.9951	20.9911	20.9125	20.5196	19.9767	19.5516 (87)
Th 2	19.9916	19.9936	19.9955	20.0047	20.0065	20.0145	20.0145	20.0160	20.0114	20.0065	20.0030	19.9993 (88)
util rest of house	0.9966	0.9890	0.9683	0.8952	0.7340	0.5114	0.3426	0.3952	0.6775	0.9365	0.9908	0.9975 (89)
MIT 2	18.7087	18.9578	19.2803	19.6714	19.9135	20.0026	20.0133	20.0135	19.9659	19.6327	19.1013	18.6747 (90)
Living area fraction	18.8180	19.0672	19.3902	19.7830	20.0301	20.1227	20.1349	20.1346	20.0831	19.7425	19.2097	18.7833 (91)
MIT	18.8180	19.0672	19.3902	19.7830	20.0301	20.1227	20.1349	20.1346	20.0831	19.7425	19.2097	18.7833 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8180	19.0672	19.3902	19.7830	20.0301	20.1227	20.1349	20.1346	20.0831	19.7425	19.2097	18.7833 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9857	0.9624	0.8888	0.7354	0.5209	0.3545	0.4078	0.6838	0.9301	0.9880	0.9964 (94)
Useful gains	880.6799	1097.7980	1247.2093	1337.2713	1210.2669	858.1940	558.2898	587.0427	889.4009	1012.6730	898.7410	825.4551 (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	2360.5505	2298.4190	2086.7198	1743.8150	1332.1777	875.2707	560.2254	590.8816	951.5556	1462.1087	1944.1966	2350.8683 (97)
Space heating kWh	1101.0237	806.8173	624.5958	292.7115	90.7016	0.0000	0.0000	0.0000	0.0000	334.3802	752.7280	1134.9074 (98a)
Space heating requirement - total per year (kWh/year)												5137.8656
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	1101.0237	806.8173	624.5958	292.7115	90.7016	0.0000	0.0000	0.0000	0.0000	334.3802	752.7280	1134.9074 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5137.8656
Space heating per m ²												35.1187 (99)

8c. Space cooling requirement

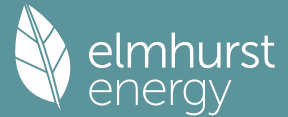
Calculated for June, July and August. See Table 10b											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1489.7616	1172.7910	1202.4636	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9082	0.9525	0.9295	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1352.9726	1117.0254	1117.6705	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1832.0809	1752.0004	1603.1676	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	344.9580	472.4214	361.2099	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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	86.2395	118.1054	90.3025	0.0000	0.0000	0.0000 (107)
Space cooling requirement											294.6473 (107)
Energy for space heating											35.1187 (99)
Energy for space cooling											2.0140 (108)
Total											37.1327 (109)
Fabric Energy Efficiency (DFEE)											37.1 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
---------------	---------------------------	----------------------	-----------------------------

Full SAP Calculation Printout



Ground floor	62.9100 (1b)	x	2.5800 (2b)	=	162.3078 (1b) - (3b)
First floor	50.1400 (1c)	x	2.7500 (2c)	=	137.8850 (1c) - (3c)
Second floor	33.2500 (1d)	x	2.1500 (2d)	=	71.4875 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000				(4)
Dwelling volume	(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =				371.6803 (5)

2. Ventilation rate

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3876	0.3800	0.3724	0.3344	0.3268	0.2888	0.2888	0.2812	0.3040	0.3268	0.3420	0.3572	(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	0.5751	0.5722	0.5693	0.5559	0.5534	0.5417	0.5417	0.5395	0.5462	0.5534	0.5585	0.5638	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			31.0800	1.1450	35.5878		(27)
TER Roof Window			2.4000	1.1450	3.6090		(27a)
Ground Floor			62.9100	0.1300	8.1783		(28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324		(29a)
Stud wall to loft	12.4700		12.4700	0.1800	2.2446		(29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670		(29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286		(30)
Ceiling to loft space	16.9000		16.9000	0.1100	1.8590		(30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484		(30)
Total net area of external elements Aum(A, m2)			286.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.6551		(33)
Main dwelling							
Party Wall			51.7400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.5171 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.2800	0.0500	0.9640
E3 Sill	14.6000	0.0500	0.7300
E3 Sill	47.3000	0.0500	2.3650
E5 Ground floor (normal)	23.2500	0.1600	3.7200
E6 Intermediate floor within a dwelling	19.2000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	20.9000	0.0400	0.8360
E13 Gable (insulation at rafter level)	11.1100	0.0800	0.8888
E16 Corner (normal)	24.9100	0.0900	2.2419
E17 Corner (inverted - internal area greater than external area)	10.5000	-0.0900	-0.9450
P1 Party wall - Ground floor	9.0700	0.0800	0.7256
P2 Party wall - Intermediate floor within a dwelling	11.7400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	11.1100	0.0800	0.8888
R1 Head of roof window	4.2000	0.0800	0.3360
R2 Sill of roof window	4.2000	0.0600	0.2520
R3 Jamb of roof window	8.4000	0.0800	0.6720
R4 Ridge (vaulted ceiling)	6.7200	0.0800	0.5376
R5 Ridge (inverted)	6.7200	0.0400	0.2688
R6 Flat ceiling	9.5600	0.0600	0.5736
R8 Roof to wall (rafter)	5.9000	0.0600	0.3540
E18 Party wall between dwellings	9.6700	0.0600	0.5802
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.9893 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	94.6444 (37)

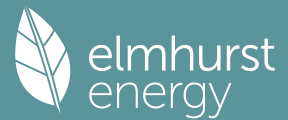
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	70.5392	70.1815	69.8309	68.1840	67.8759	66.4415	66.4415	66.1759	66.9940	67.8759	68.4992	69.1509	(38)
Heat transfer coeff	165.1837	164.8259	164.4753	162.8284	162.5203	161.0859	161.0859	160.8203	161.6384	162.5203	163.1436	163.7953	(39)
Average = Sum(39)m / 12 =													162.8269

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1291	1.1266	1.1242	1.1130	1.1109	1.1011	1.1011	1.0992	1.1048	1.1109	1.1151	1.1196	(40)
HLP (average)													1.1130
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Full SAP Calculation Printout



Assumed occupancy												2.9282 (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	(42a)
Hot water usage for baths	31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449 (42b)
Hot water usage for other uses	44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181 (42c)
Average daily hot water use (litres/day)												69.9082 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.2700	74.1774	71.8930	69.0500	66.5136	63.8777	63.3303	65.6101	67.9483	70.6552	73.5233	76.1630 (44)
Energy content (annual)	120.7930	105.6277	110.4969	94.5260	89.5401	78.5451	76.5925	81.2390	83.7871	95.8784	104.7474	119.2528 (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	102.6741	89.7835	93.9223	80.3471	76.1091	66.7633	65.1036	69.0532	71.2190	81.4966	89.0353	101.3649 (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	102.6741	89.7835	93.9223	80.3471	76.1091	66.7633	65.1036	69.0532	71.2190	81.4966	89.0353	101.3649 (64)
12Total per year (kWh/year)												986.8721 (64)
Electric shower(s)	58.7146	52.3152	57.1262	54.5148	55.5377	52.9776	54.7435	55.5377	54.5148	57.1262	56.0520	58.7146 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												667.8748 (64a)
Heat gains from water heating, kWh/month	40.3472	35.5247	37.7621	33.7155	32.9117	29.9352	29.9618	31.1477	31.4334	34.6557	36.2718	40.0199 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	159.6219	176.7243	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219	164.9426	159.6219	164.9426	159.6219 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.4683	319.7522	311.4768	293.8593	271.6205	250.7191	236.7557	233.4717	241.7472	259.3646	281.6035	302.5049 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297 (71)
Water heating gains (Table 5)	54.2301	52.8641	50.7555	46.8270	44.2362	41.5767	40.2712	41.8652	43.6576	46.5802	50.3775	53.7901 (72)
Total internal gains	597.2439	616.2642	588.7779	572.5527	542.4022	524.1621	503.5724	501.8825	517.2710	532.4904	563.8473	582.8406 (73)

6. Solar gains

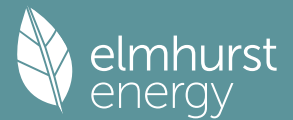
[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					6.4700	10.6334		0.6300	0.7000	0.7700		21.0256 (74)	
Northeast					2.7000	11.2829		0.6300	0.7000	0.7700		9.3102 (75)	
South					14.2200	46.7521		0.6300	0.7000	0.7700		203.1759 (78)	
West					4.9900	19.6403		0.6300	0.7000	0.7700		29.9516 (80)	
Northwest					2.7000	11.2829		0.6300	0.7000	0.7700		9.3102 (81)	
North					2.4000	15.6897		0.6300	0.7000	1.0000		14.9454 (82)	
Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600 (83)	
Total gains	884.9627	1113.7222	1295.9563	1504.6407	1645.6439	1647.6772	1574.8418	1439.6890	1300.6612	1088.7687	909.6407	828.4006 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.4345	58.5614	58.6862	59.2798	59.3922	59.9210	59.9210	60.0200	59.7162	59.3922	59.1652	58.9298
alpha	4.8956	4.9041	4.9124	4.9520	4.9595	4.9947	4.9947	5.0013	4.9811	4.9595	4.9443	4.9287
util living area	0.9974	0.9917	0.9765	0.9222	0.7949	0.6017	0.4454	0.5047	0.7630	0.9567	0.9934	0.9981 (86)
MIT	19.5633	19.8130	20.1419	20.5524	20.8438	20.9696	20.9944	20.9899	20.9054	20.5015	19.9525	19.5231 (87)
Th 2	19.9772	19.9791	19.9811	19.9903	19.9920	20.0000	20.0000	20.0014	19.9969	19.9920	19.9885	19.9849 (88)
util rest of house	0.9966	0.9891	0.9690	0.8980	0.7398	0.5174	0.3466	0.3998	0.6835	0.9381	0.9909	0.9975 (89)
MIT 2	18.6693	18.9188	19.2440	19.6410	19.8919	19.9867	19.9986	19.9986	19.9475	19.6038	19.0660	18.6351 (90)
Living area fraction	18.7800	19.0296	19.3552	19.7539	20.0098	20.1084	20.1219	20.1214	20.0662	19.7150	19.1758	18.7451 (91)
MIT	18.7800	19.0296	19.3552	19.7539	20.0098	20.1084	20.1219	20.1214	20.0662	19.7150	19.1758	18.7451 (92)
Temperature adjustment	18.7800	19.0296	19.3552	19.7539	20.0098	20.1084	20.1219	20.1214	20.0662	19.7150	19.1758	18.7451 (93)
adjusted MIT	18.7800	19.0296	19.3552	19.7539	20.0098	20.1084	20.1219	20.1214	20.0662	19.7150	19.1758	18.7451 (93)

8. Space heating requirement

Full SAP Calculation Printout



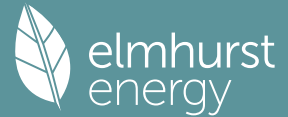
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9951	0.9858	0.9630	0.8913	0.7409	0.5270	0.3588	0.4127	0.6896	0.9315	0.9881	0.9964	(94)
Useful gains	880.6622	1097.9199	1248.0074	1341.0569	1219.1955	868.2519	565.1084	594.1185	896.9048	1014.2065	898.8043	825.4334	(95)
Ext temp.	4.3000	4.9000	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	2391.8620	2328.9205	2114.3664	1767.3169	1350.5127	887.3266	567.3272	598.4768	964.3633	1481.3721	1970.0927	2382.4232	(97)
Space heating kWh	1124.3327	827.2324	644.5711	306.9072	97.7000	0.0000	0.0000	0.0000	0.0000	347.5712	771.3276	1158.4004	(98a)
Space heating requirement - total per year (kWh/year)												5278.0426	
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	1124.3327	827.2324	644.5711	306.9072	97.7000	0.0000	0.0000	0.0000	0.0000	347.5712	771.3276	1158.4004	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5278.0426	
Space heating per m2										(98c) / (4) =		36.0768	(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	1514.2074	1192.0356	1222.2340	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9016	0.9481	0.9239	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1365.2613	1130.2280	1129.1993	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1832.0809	1752.0004	1603.1676	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	336.1101	462.5987	352.6324	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	84.0275	115.6497	88.1581	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												287.8353	(107)
Energy for space heating												36.0768	(99)
Energy for space cooling												1.9674	(108)
Total												38.0443	(109)
Fabric Energy Efficiency (TFEE)												38.0	(109)

Full SAP Calculation Printout



Property Reference	Plot 2				Issued on Date	13/11/2025	
Assessment Reference	00001			Prop Type Ref	Plot 2		
Property							
SAP Rating	81 B		DER	3.85		TER	9.34
Environmental	96 A		% DER < TER				58.78
CO ₂ Emissions (t/year)	0.54		DFEE	37.13		TFEE	38.04
Compliance Check	See BREL		% DFEE < TFEE				2.40
% DPER < TPER	17.38		DPER	40.23		TPER	48.69
Assessor Details	Mr. Matthew Stainrod					Assessor ID	AU83-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	62.9100 (1b)	x 2.5800 (2b)	= 162.3078 (1b) - (3b)
First floor	50.1400 (1c)	x 2.7500 (2c)	= 137.8850 (1c) - (3c)
Second floor	33.2500 (1d)	x 2.1500 (2d)	= 71.4875 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 371.6803 (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) =	0.1076 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0100	(17)
Infiltration rate	0.3581	(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) =	0.3044 (21)

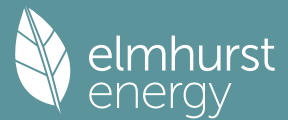
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3881	0.3805	0.3729	0.3348	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577 (22b)
Effective ac	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			2.1000	1.0000	2.1000		(26)
Window			31.0800	1.1450	35.5878		(27)
Roof Window			2.4000	1.1450	2.7481		(27a)
Ground Floor			62.9100	0.1300	8.1783	110.0000	6920.1000 (28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324	150.0000	14277.0000 (29a)
Stud wall to loft	12.4700		12.4700	0.0800	0.9976	9.0000	112.2300 (29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670	9.0000	118.3500 (29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286	9.0000	362.3400 (30)
Ceiling to loft space	16.9000		16.9000	0.0800	1.3520	9.0000	152.1000 (30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484	9.0000	93.9600 (30)
Total net area of external elements A _{um} (A, m ²)			286.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		76.0402		(33)
Main dwelling							
Party Wall			51.7400	0.0000	0.0000	70.0000	3621.8000 (32)
Block			74.0000			75.0000	5550.0000 (32c)
Stud			143.0000			9.0000	1287.0000 (32c)
First			50.1400			18.0000	902.5200 (32d)
Second			33.2500			18.0000	598.5000 (32d)

[illegible]

Full SAP Calculation Printout



729.3638 746.6386 715.1057 689.0992 653.1896 628.8596 604.1056 605.1953 623.9373 645.9418 686.6318 713.6309 (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					6.4700	10.6334	0.6300	0.7000				0.7700			21.0256 (74)
Northeast					2.7000	11.2829	0.6300	0.7000				0.7700			9.3102 (75)
South					14.2200	46.7521	0.6300	0.7000				0.7700			203.1759 (78)
West					4.9900	19.6403	0.6300	0.7000				0.7700			29.9516 (80)
Northwest					2.7000	11.2829	0.6300	0.7000				0.7700			9.3102 (81)
North					2.4000	15.6897	0.6300	0.7000				1.0000			14.9454 (82)

Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600			(83)
Total gains	1017.0826	1244.0965	1422.2841	1621.1873	1756.4313	1752.3747	1675.3749	1543.0019	1407.3275	1202.2201	1032.4252	959.1910			(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.3650	59.4963	59.6255	60.2401	60.3565	60.9043	60.9043	61.0068	60.6921	60.3565	60.1215	59.8778
alpha	4.9577	4.9664	4.9750	5.0160	5.0238	5.0603	5.0603	5.0671	5.0461	5.0238	5.0081	4.9919
util living area	0.9952	0.9867	0.9657	0.8987	0.7579	0.5629	0.4133	0.4661	0.7168	0.9368	0.9886	0.9964 (86)
Living	19.6912	19.9356	20.2510	20.6286	20.8796	20.9785	20.9963	20.9933	20.9316	20.5859	20.0669	19.6508
Non living	18.8076	19.0508	19.3602	19.7204	19.9311	20.0053	20.0136	20.0142	19.9769	19.6920	19.1899	18.7735
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	20.3305	19.9356	20.2510	20.6286	20.8796	20.9785	20.9963	20.9933	20.9316	20.5859	20.0669	19.8395 (87)
Th 2	19.9916	19.9936	19.9955	20.0047	20.0065	20.0145	20.0145	20.0160	20.0114	20.0065	20.0030	19.9993 (88)
util rest of house	0.9937	0.9827	0.9553	0.8700	0.7007	0.4829	0.3223	0.3692	0.6363	0.9121	0.9844	0.9952 (89)
MIT 2	19.3859	19.0508	19.3602	19.7204	19.9311	20.0053	20.0136	20.0142	19.9769	19.6920	19.1899	18.9450 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.5029	19.1604	19.4705	19.8329	20.0486	20.1258	20.1353	20.1354	20.0952	19.8027	19.2985	19.0558 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5029	19.1604	19.4705	19.8329	20.0486	20.1258	20.1353	20.1354	20.0952	19.8027	19.2985	19.0558 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9928	0.9782	0.9485	0.8643	0.7033	0.4922	0.3336	0.3812	0.6437	0.9059	0.9804	0.9937 (94)
Useful gains	1009.7158	1217.0247	1349.0671	1401.2462	1235.2413	862.4607	558.8281	588.1903	905.8327	1089.0685	1012.2224	953.1942 (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	2471.9032	2313.5492	2099.7204	1751.8066	1335.1314	875.7568	560.2903	591.0175	953.4682	1471.7323	1958.4581	2394.7813 (97)
Space heating kWh	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98a)
Space heating requirement - total per year (kWh/year)	4748.4721											
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	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4748.4721											
Space heating per m2	(98c) / (4) = 32.4571 (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 %)	277.9600 (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	1087.8674	736.8644	558.4861	252.4035	74.3182	0.0000	0.0000	0.0000	0.0000	284.7019	681.2898	1072.5408 (98)
Space heating efficiency (main heating system 1)	277.9600	277.9600	277.9600	277.9600	277.9600	0.0000	0.0000	0.0000	0.0000	277.9600	277.9600	277.9600 (210)
Space heating fuel (main heating system)	391.3755	265.0973	200.9232	90.8057	26.7370	0.0000	0.0000	0.0000	0.0000	102.4255	245.1035	385.8615 (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	337.1949	298.2746	316.4600	276.5643	267.0991	239.5371	235.2823	245.0690	248.3062	278.3051	297.7604	333.2356 (64)
Efficiency of water heater (217)m	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613	186.3613 (216)
Fuel for water heating, kWh/month	180.9361	160.0518	169.8099	148.4022	143.3233	128.5337	126.2506	131.5021	133.2391	149.3363	159.7759	178.8116 (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	35.0093	28.0858	25.2881	18.5272	14.3109	11.6921	13.0549	16.9692	22.0414	28.9195	32.6645	35.9823 (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)

Full SAP Calculation Printout



Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1708.3292	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													186.3613	
Water heating fuel used													1809.9725	(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)													282.5451	(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													3800.8468	(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	1708.3292	0.1565	267.3014	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1809.9725	0.1410	255.2254	(264)
Space and water heating			522.5269	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	282.5451	0.1443	40.7800	(268)
Total CO2, kg/year			563.3069	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1708.3292	1.5792	2697.8628	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1809.9725	1.5214	2753.7138	(278)
Space and water heating			5451.5766	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	282.5451	1.5338	433.3772	(282)
Total Primary energy kWh/year			5884.9538	(286)
Dwelling Primary energy Rate (DPER)			40.2300	(287)

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

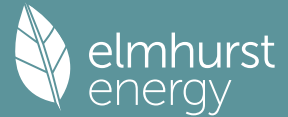
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	62.9100 (1b)	x 2.5800 (2b)	= 162.3078	(1b) - (3b)
First floor	50.1400 (1c)	x 2.7500 (2c)	= 137.8850	(1c) - (3c)
Second floor	33.2500 (1d)	x 2.1500 (2d)	= 71.4875	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	146.3000			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	371.6803 (5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		

Full SAP Calculation Printout



Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1076 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3576 (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) =	0.3040 (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 infiltr 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	0.3876	0.3800	0.3724	0.3344	0.3268	0.2888	0.2888	0.2812	0.3040	0.3268	0.3420	0.3572	(22b)
	0.5751	0.5722	0.5693	0.5559	0.5534	0.5417	0.5417	0.5395	0.5462	0.5534	0.5585	0.5638	(25)

3. Heat losses and heat loss parameter

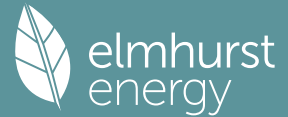
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			31.0800	1.1450	35.5878			(27)
TER Roof Window			2.4000	1.1450	3.6090			(27a)
Ground Floor			62.9100	0.1300	8.1783			(28a)
External Wall	126.2000	31.0200	95.1800	0.1800	17.1324			(29a)
Stud wall to loft	12.4700		12.4700	0.1800	2.2446			(29a)
Dormer Cheeks	15.3100	2.1600	13.1500	0.1800	2.3670			(29a)
Main Roof	42.6600	2.4000	40.2600	0.1100	4.4286			(30)
Ceiling to loft space	16.9000		16.9000	0.1100	1.8590			(30)
Dormer Roof	10.4400		10.4400	0.1100	1.1484			(30)
Total net area of external elements Aum(A, m2)			286.8900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.6551			(33)
Main dwelling								
Party Wall			51.7400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.5171	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				19.2800	0.0500	0.9640		
E3 Sill				14.6000	0.0500	0.7300		
E3 Sill				47.3000	0.0500	2.3650		
E5 Ground floor (normal)				23.2500	0.1600	3.7200		
E6 Intermediate floor within a dwelling				19.2000	0.0000	0.0000		
E11 Eaves (insulation at rafter level)				20.9000	0.0400	0.8360		
E13 Gable (insulation at rafter level)				11.1100	0.0800	0.8888		
E16 Corner (normal)				24.9100	0.0900	2.2419		
E17 Corner (inverted - internal area greater than external area)				10.5000	-0.0900	-0.9450		
P1 Party wall - Ground floor				9.0700	0.0800	0.7256		
P2 Party wall - Intermediate floor within a dwelling				11.7400	0.0000	0.0000		
P5 Party wall - Roof (insulation at rafter level)				11.1100	0.0800	0.8888		
R1 Head of roof window				4.2000	0.0800	0.3360		
R2 Sill of roof window				4.2000	0.0600	0.2520		
R3 Jamb of roof window				8.4000	0.0800	0.6720		
R4 Ridge (vaulted ceiling)				6.7200	0.0800	0.5376		
R5 Ridge (inverted)				6.7200	0.0400	0.2688		
R6 Flat ceiling				9.5600	0.0600	0.5736		
R8 Roof to wall (rafter)				5.9000	0.0600	0.3540		
E18 Party wall between dwellings				9.6700	0.0600	0.5802		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9893	(36)
Point Thermal Bridges							0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	94.6444	(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	70.5392	70.1815	69.8309	68.1840	67.8759	66.4415	66.4415	66.1759	66.9940	67.8759	68.4992	69.1509	(38)
Average = Sum(39)m / 12 =	165.1837	164.8259	164.4753	162.8284	162.5203	161.0859	161.0859	160.8203	161.6384	162.5203	163.1436	163.7953	(39)
												162.8269	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1291	1.1266	1.1242	1.1130	1.1109	1.1011	1.1011	1.0992	1.1048	1.1109	1.1151	1.1196	(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												2.9282 (42)
Hot water usage for mixer showers	73.3168	72.2150	70.6095	67.5375	65.2705	62.7424	61.3054	62.8988	64.6454	67.3599	70.4978	73.0359 (42a)
Hot water usage for baths	31.6519	31.1818	30.5198	29.2993	28.3854	27.3720	26.8246	27.4819	28.1976	29.2820	30.5277	31.5449 (42b)
Hot water usage for other uses	44.6181	42.9957	41.3732	39.7507	38.1282	36.5057	36.5057	38.1282	39.7507	41.3732	42.9957	44.6181 (42c)
Average daily hot water use (litres/day)												137.5039 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	149.5868	146.3925	142.5025	136.5875	131.7841	126.6201	124.6357	128.5089	132.5938	138.0151	144.0212	149.1989 (44)
Energy conte	236.9090	208.4609	219.0210	186.9815	177.4067	155.6942	150.7361	159.1209	163.5014	187.2852	205.1845	233.6095 (45)
Energy content (annual)	Total = Sum(45)m =											2283.9108
Distribution loss (46)m = 0.15 x (45)m												
	35.5363	31.2691	32.8532	28.0472	26.6110	23.3541	22.6104	23.8681	24.5252	28.0928	30.7777	35.0414 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)

Full SAP Calculation Printout



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													
	287.8351	254.4587	269.9471	236.2648	228.3328	204.9775	201.6621	210.0469	212.7847	238.2112	254.4678	284.5355 (62)	
WWHRS	-33.5174	-29.6431	-31.0405	-25.7028	-23.9541	-20.4977	-19.2133	-20.4314	-21.2077	-25.0015	-28.3237	-32.8967 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h													
	254.3177	224.8156	238.9066	210.5620	204.3788	184.4798	182.4489	189.6155	191.5770	213.2097	226.1442	251.6388 (64)	
										Total per year (kWh/year) = Sum(64)m =			2572.0946 (64)
													2572 (64)
12Total per year (kWh/year)													
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000 (64a)
Heat gains from water heating, kWh/month													
	119.5131	106.1115	113.5653	101.5980	99.7286	91.1949	90.8606	93.6485	93.7908	103.0132	107.6505	118.4160 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121	146.4121 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	159.6219	176.7243	159.6219	164.9426	159.6219	164.9426	159.6219	159.6219	164.9426	159.6219	164.9426	159.6219 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	316.4683	319.7522	311.4768	293.8593	271.6205	250.7191	236.7557	233.4717	241.7472	259.3646	281.6035	302.5049 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412	37.6412 (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)												
	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297	-117.1297 (71)
Water heating gains (Table 5)												
	160.6359	157.9039	152.6416	141.1083	134.0438	126.6596	122.1245	125.8717	130.2651	138.4586	149.5146	159.1613 (72)
Total internal gains												
	706.6497	724.3041	693.6639	669.8339	635.2098	609.2450	585.4257	585.8890	603.8785	627.3687	665.9843	691.2117 (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				6.4700	10.6334		0.6300		0.7000		0.7700		21.0256 (74)
Northeast				2.7000	11.2829		0.6300		0.7000		0.7700		9.3102 (75)
South				14.2200	46.7521		0.6300		0.7000		0.7700		203.1759 (78)
West				4.9900	19.6403		0.6300		0.7000		0.7700		29.9516 (80)
Northwest				2.7000	11.2829		0.6300		0.7000		0.7700		9.3102 (81)
North				2.4000	15.6897		0.6300		0.7000		1.0000		14.9454 (82)
Solar gains	287.7188	497.4579	707.1784	932.0881	1103.2417	1123.5151	1071.2694	937.8065	783.3902	556.2783	345.7934	245.5600	(83)
Total gains	994.3685	1221.7620	1400.8424	1601.9220	1738.4516	1732.7601	1656.6950	1523.6955	1387.2687	1183.6471	1011.7777	936.7717	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.4345	58.5614	58.6862	59.2798	59.3922	59.9210	59.9210	60.0200	59.7162	59.3922	59.1652	58.9298
alpha	4.8956	4.9041	4.9124	4.9250	4.9395	4.9947	4.9947	5.0013	4.9811	4.9595	4.9443	4.9287
util living area												
	0.9957	0.9879	0.9684	0.9053	0.7691	0.5761	0.4243	0.4787	0.7310	0.9418	0.9897	0.9967 (86)
MIT	19.6455	19.8914	20.2117	20.6005	20.8660	20.9748	20.9955	20.9920	20.9222	20.5578	20.0275	19.6051 (87)
Th 2	19.9772	19.9791	19.9811	19.9903	19.9920	20.0000	20.0000	20.0014	19.9969	19.9920	19.9885	19.9849 (88)
util rest of house												
	0.9943	0.9841	0.9587	0.8776	0.7121	0.4939	0.3297	0.3782	0.6500	0.9185	0.9859	0.9957 (89)
MIT 2	18.4039	18.7176	19.1210	19.5961	19.8837	19.9860	19.9985	19.9986	19.9461	19.5588	18.8995	18.3577 (90)
Living area fraction												0.1239 (91)
MIT	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5576	18.8630	19.2561	19.7205	20.0054	20.1085	20.1220	20.1217	20.0670	19.6825	19.0392	18.5122 (93)

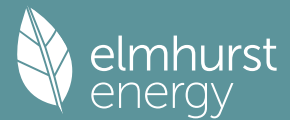
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9915	0.9785	0.9497	0.8690	0.7129	0.5031	0.3414	0.3906	0.6561	0.9094	0.9808	0.9934 (94)
Useful gains	985.8815	1195.4577	1330.3779	1392.0241	1239.3095	871.7605	565.5747	595.1113	910.2485	1076.4417	992.3108	930.6268 (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												
	2355.1298	2301.4670	2098.0670	1761.8782	1349.7967	887.3436	567.3446	598.5182	964.4928	1476.0953	1947.8034	2344.2700 (97)
Space heating kWh												
	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506 (98a)
Space heating requirement - total per year (kWh/year)												
	4718.6647											4718.6647
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
Space heating kWh												
	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4718.6647
Space heating per m ²												(98c) / (4) =
												32.2533 (99)

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

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

Full SAP Calculation Printout



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	1018.7208	743.2383	571.1607	266.2949	82.2025	0.0000	0.0000	0.0000	0.0000	297.3423	687.9547	1051.7506 (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)	1103.7062	805.2419	618.8090	288.5102	89.0601	0.0000	0.0000	0.0000	0.0000	322.1477	745.3464	1139.4914 (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	254.3177	224.8156	238.9066	210.5620	204.3788	184.4798	182.4489	189.6155	191.5770	213.2097	226.1442	251.6388 (64)
Efficiency of water heater	86.8434	86.5335	85.9414	84.5875	82.1894	79.8000	79.8000	79.8000	79.8000	84.8058	86.3896	79.8000 (216)
Fuel for water heating, kWh/month	292.8464	259.8018	277.9877	248.9280	248.6681	231.1777	228.6327	237.6135	240.0714	251.4094	261.7725	86.9077 (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	33.1663	26.6072	23.9569	17.5518	13.5575	11.0766	12.3676	16.0759	20.8810	27.3970	30.9449	34.0881 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-57.0777	-79.5772	-113.1041	-125.6442	-134.1240	-124.5903	-122.9154	-116.6132	-105.4208	-90.1308	-62.3775	-49.4408 (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	-35.0349	-73.3598	-145.2289	-217.3430	-286.7027	-287.9315	-284.6714	-241.4568	-177.4593	-104.8070	-46.7308	-27.7423 (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												5112.3127 (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												3068.4565 (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)												267.6709 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3109.4844 (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												5424.9558 (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	5112.3127	0.2100	1073.5857 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3068.4565	0.2100	644.3759 (264)
Space and water heating			1717.9616 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	267.6709	0.1443	38.6332 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1181.0159	0.1349	-159.2645
PV Unit electricity exported	-1928.4684	0.1260	-242.9710
Total			-402.2355 (269)
Total CO2, kg/year			1366.2885 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5112.3127	1.1300	5776.9134 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3068.4565	1.1300	3467.3559 (278)
Space and water heating			9244.2693 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	267.6709	1.5338	410.5625 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1181.0159	1.4984	-1769.6486
PV Unit electricity exported	-1928.4684	0.4625	-891.8774
Total			-2661.5260 (283)
Total Primary energy kWh/year			7123.4067 (286)
Target Primary Energy Rate (TPER)			48.6900 (287)

