



Stevenage Road
Hitchin
SG4 7JY

Energy Statement

Planning Issue 1



Applicant Name:	Bugler Homes Ltd
Applicant Address:	Bugler House 25 High Street Rickmansworth Hertfordshire WD3 1ET
Site Address:	Land at Stevenage Road Hitchin SG4 7JY
Project Reference:	5810
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Prepared by:	AJ
Checked by:	AF
Validated by:	AF



Document Issue Register

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C O N T E N T S

	Page
EXECUTIVE SUMMARY	1
1.00 Introduction	2
2.00 Policy Review and Context	3
3.00 Energy Strategy Targets	3
4.00 Fabric First – Reducing Energy Demand	4
5.00 LZC Feasibility – Renewable Energy Technology	4
6.00 Carbon Reduction Results	5

Appendices

- Appendix A** – SAP Worksheets for Typical Dwellings
- Appendix B** – North Herts Bronze, Silver, Gold Checklist



EXECUTIVE SUMMARY

This Energy Statement has been prepared by Watkins Payne on behalf of Bugler Homes Ltd in support of a reserved matters application for Land at Stevenage Road.

This report details the energy strategy for achieving a low carbon design for the proposed development and provides the supporting evidence via dynamic simulation modelling. The assessment is carried out in accordance with the North Herts Local Plan and Sustainability Supplementary Planning Document (SPD).

The energy strategy follows the approach set out within North Herts' SPD where it is advised that 'Compliance with the building regulations represents minimum requirements or SPD bronze level. Applicants are encouraged to seek an onsite reduction in regulated carbon emissions of at least 35% beyond the baseline of Part L of the building regulations (silver level). This is to be achieved using energy efficiency measures alone reducing energy demand as far as possible.'

The projected annual CO₂ emissions and reduction for the sample dwellings of the development are summarised in the tables below.

Plot Reference	DER (kgCO ₂ /yr/m ²)	TER (kgCO ₂ /yr/m ²)	% DER < TER
Plot 01	2.75	10.81	74.56
Plot 02	2.41	9.13	73.60
Plot 04	2.99	12.18	75.45
Plot 08	3.09	12.56	75.40
Plot 14	2.86	11.53	75.20
Plot 18	3.05	12.23	75.06
Plot 19	3.17	8.66	63.39
Plot 24	3.30	9.31	64.55
Plot 26	2.92	10.32	71.71
Plot 27	2.70	10.49	74.26
Plot 35	2.93	10.73	72.69
Plot 41	2.90	11.43	74.63
Plot 46	2.67	9.08	70.59
Plot 47	2.94	10.45	71.87
Plot 48	3.08	10.9	71.74

1.00 INTRODUCTION

1.01 Purpose of Report

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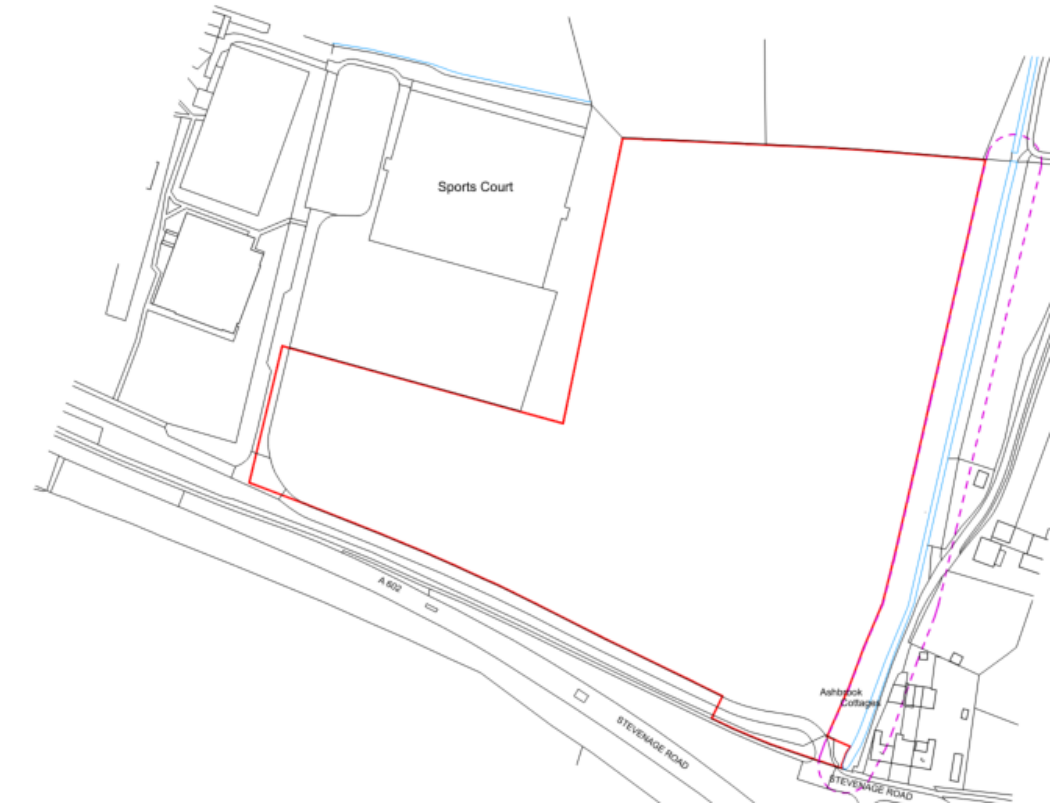
The purpose of the report is to demonstrate how carbon savings are maximised within the development, in line with both regional and local planning requirements. It also assesses the suitability of low and zero carbon (LZC/renewable) technologies for the development, taking into account technical feasibility, space constraints, commercial viability, environmental impact as well as long term maintenance and associated costs. Furthermore, it demonstrates how the relevant sustainability-related planning policies have been addressed for the proposed scheme.

1.02 Existing Site

The site currently comprises an open grass field.

1.03 Proposed Development

Erection of 50no. residential dwellings (including affordable housing), new public open space, associated parking, landscaping and access.



Site location of existing Stevenage Road site



Proposed Site Plan (Credit: On Architecture)

2.00 POLICY REVIEW AND CONTEXT

Multiple layers of energy and carbon targets apply to this scheme at national, regional and local level, these include:

- North Herts Local Plan 2011 - 2031
- North Herts Sustainability Supporting Planning Document (SPD) September 2024.



Figure 1 | Relevant Planning Documents

The local policy for North Herts (North Herts Local Plan 2011 - 2031) seeks to ensure that all new residential developments are built in line with Building Regulations and to meet a required carbon emissions target which is explained more within the September 2024 SPD

The North Herts Sustainability Supporting Planning Document prioritises a fabric first approach seeking to optimise the building envelope (walls, windows, roofs, doors and floors). By focusing on high performance insulation, achieving air tightness, incorporating passive design features like natural ventilation and solar heat gain the fabric first approach reduces the buildings energy demands from the outset. This translates to less reliance on heating and cooling systems, lowering operational carbon (and costs) and creating a more sustainable dwelling.

The SPD specifically asks that compliance with Building Regulations represents minimum requirements or SPD bronze level. Applicants are encouraged to seek an onsite reduction in regulated carbon emissions of at least 35% beyond the baseline of Part L of the Building Regulations (silver level). This is to be achieved using energy efficiency measures alone reducing energy demand as far as possible.

3.00 ENERGY STRATEGY TARGETS

The energy strategy has been developed in line with the North Herts SPD requirements, following the criteria of seeking an onsite reduction in regulated carbon emissions of at least 35%. Along with the onsite reduction North Herts SPD Checklist has been reviewed to determine how the development will aim for bronze, silver and gold categories. The associated checklist can be found with Appendix B

To accurately analyse the development, all typical house and bungalow types were accounted for within the SAP assessments.

The site layout below highlights the typical houses and bungalows.



Figure 2 | Site plan showing typical dwellings used for SAP assessments



4.00 FABRIC FIRST – REDUCING ENERGY DEMAND

The section below shows how the development is taking the fabric first approach seriously and aiming to incorporate building fabric U-values which surpass Building Regulations recommendations and lowering energy demand as much as possible.

Where possible passive design measures have been incorporated, including:

- Improvements to the U-values for all building elements when compared with the limiting values of Part L of the Building Regulations.
- Improved airtightness compared to Part L. All fabric parameters are better than the notional specification. There is a budgetary trade-off between increasing wall versus window performance.

Active design measures have been applied to the scheme include:

- Energy efficient lighting throughout.
- Energy efficiency mechanical ventilation systems with heat recovery above the notional specification.

	Part L1A (2013) Minimum Performance	Part L1A (2013) Notional Performance	Proposed Building Performance
Construction Element	U Value W/m ² K		U Value W/m ² K
Ground Floor	0.25	0.13	0.08
External Wall	0.30	0.18	0.10
Roof	0.20	0.13	0.09
Windows	2.0	1.4	0.80
	Infiltration (m ³ /hr.m ² at 50Pa)		Infiltration (m ³ /hr.m ² at 50Pa)
Air Tightness	10	5	2.0

Table 1 | Comparison of domestic development fabric specification versus the Building Regulations

5.00 LZC FEASIBILITY – RENEWABLE ENERGY TECHNOLOGY

For the purpose of this energy statement a feasibility assessment of potential renewable energy technologies has been undertaken, and the results from this are presented below:

Technology	Appraisal	Included in the Development
Air Source Heat Pumps (ASHP)	This Technology is deemed appropriate to provide both space heating and hot water to the residential dwellings.	YES
Biomass	This technology is not considered a practical solution to reducing greenhouse gas emissions. There is limited storage space for the combustible material alongside accessibility to site for regular deliveries of the materials which in itself has associated greenhouse gas emissions. Local air quality will also be adversely affected by the combustion of the biomass material.	NO
Ground Source Heat Pumps (GSHP)	This technology is deemed not appropriate as air source heat pumps has already incorporated into the scheme.	NO
Photovoltaics (PV)	As detailed below, the use of PV panel is appropriate for this scheme but due to exceeding over the required 35% better than Part L through the use of heat pumps it has been decided that PV panels will not be installed.	NO
Solar Thermal Hot Water	Whilst this technology is technically feasible, this technology has been rejected on the basis that hot water produced by the ASHP would compete with the solar hot water system. Therefore, this technology is therefore rejection.	NO
Wind Turbines	This technology was rejected on the basis of its potential impact on visual amenity and relatively low efficiency from unpredictable, turbulent wind conditions in urban locations	NO

Table 2 | LZC feasibility study



5.01 Air Source Heat Pumps

An air source heat pump (ASHP) works on the same principles as a ground source heat pump (GSHP) however the medium in which heat is extracted is the external air rather than the ground. ASHP will generally have a slightly lower seasonal coefficient of performance when compared to GSHP.

Associated pipework will be sufficiently insulated and where routed externally traced heated in order to ensure that the system runs efficiently and that's losses are minimised.

In order to ensure that the systems are operated as efficiently as possible, end users will be provided with information relating to the control and operation of the system. The performance of the system will be monitored post construction to see that the required level of efficiency is achieved.

Air source heat pumps are suitable for use in the proposed development. They will provide the heating and hot water for all dwellings. Efficiencies used for the system can be seen within the table at the end of this section.

Heat Network	
Heat Network Type	Space and Water Separate
Heat Source 1	
Source	Heat Pump
Heating Use	Space & Water
Efficiency (Winter)	270.31
Efficiency (Summer)	285.68
Heating Controls	Programmer and at least two room thermostats
Water Heating	
Hot Water System	Via Heat Source 1

Table 3 | proposed heating and hot water system

6.00 CARBON REDUCTION RESULTS

Plot Reference	DER	TER	% DER < TER
Plot 01	2.75	10.81	74.56
Plot 02	2.41	9.13	73.60
Plot 04	2.99	12.18	75.45
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The results show that the typical dwellings within Stevenage Road show a carbon reduction of at least 63% which comfortably meets the criteria shown within North Herts Local Plan and associated Supplementary Planning Documents (SPD's).

Summary

The energy strategy for Stevenage Road achieves a minimum of 63.39% and maximum of 75.40% reduction in regulated CO₂ emissions against the Part L compliant baseline.

In alignment with North Herts Local Plan, the energy strategy has made the fullest contribution to minimising energy demand, maximising on-site carbon savings and making the fullest contribution to the efficient supply of energy through renewable technologies. The strategy has maximised all technically and economically viable energy efficiency measures, including:

- Enhanced building fabric performance (meeting or surpassing Part L standards)
- Low g-value glazing to reduce solar gains
- High-efficiency mechanical and electrical services

These measures collectively ensure that the development achieves the fullest possible contribution toward a low-carbon, energy-efficient refurbishment, while remaining compliant with National and Local Plan policies.

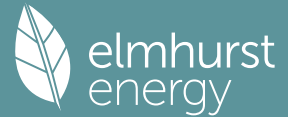


Appendices



Appendix A – SAP Worksheets for Typical Dwellings

Full SAP Calculation Printout



Plot Reference	Plot 01				Issued on Date	17/12/2025	
Assessment Reference	Plot 01			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	88 B	DER	2.75	TER	10.81		
Environmental	98 A	% DER < TER				74.56	
CO ₂ Emissions (t/year)	0.23	DFEE	33.42	TFEE	35.83		
Compliance Check	See BREL	% DFEE < TFEE				6.73	
% DPER < TPER	48.42	DPER	29.16	TPER	56.53		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	46.7100 (1b)	x 3.0000 (2b)	= 140.1300 (1b) - (3b)
First floor	46.7100 (1c)	x 2.4000 (2c)	= 112.1040 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.2340 (5)

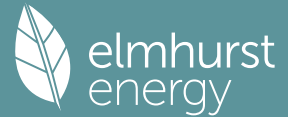
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.0000 (17)
Infiltration rate	0.1000 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.0925 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.1179 0.1156 0.1133 0.1018 0.0994 0.0879 0.0879 0.0856 0.0925 0.0994 0.1041 0.1087 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)
Effective ac	0.1994 0.1971 0.1948 0.1832 0.1809 0.1694 0.1694 0.1671 0.1740 0.1809 0.1856 0.1902 (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							
Glazing			10.1300	0.7752	7.8527		(27)
Front Door			2.2300	1.0000	2.2300		(26)
Heatloss Floor 1			46.7100	0.0800	3.7368	75.0000	3503.2500 (28a)
00 Ext Wall	46.4400	7.4100	39.0300	0.1000	3.9030	190.0000	7415.6997 (29a)
01 Ext Wall	58.0500	4.9500	53.1000	0.1000	5.3100	190.0000	10088.9999 (29a)
Roof	46.7100		46.7100	0.0900	4.2039	9.0000	420.3900 (30)
Total net area of external elements A _{um} (A, m ²)			197.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2364		(33)
Main dwelling							
Ground			21.7900	0.0000	0.0000	180.0000	3922.2002 (32)
First			20.7600	0.0000	0.0000	180.0000	3736.8000 (32)
00 Internal Wall			84.1900			9.0000	757.7100 (32c)
01 Internal Wall			96.7200			9.0000	870.4800 (32c)
Internal Floor 1			46.7100			18.0000	840.7800 (32d)

Full SAP Calculation Printout



Ground	46.7100								9.0000			420.3900 (32e)		
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) =					31976.6998 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													342.2897 (35)	
Thermal bridges (User defined value 0.100 * total exposed area)													19.7910 (36)	
Point Thermal bridges								(36a) =					0.0000	
Total fabric heat loss								(33) + (36) + (36a) =					47.0274 (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	16.6006	16.4081	16.2157	15.2532	15.0607	14.0983	14.0983	13.9058	14.4833	15.0607	15.4457	15.8307 (38)		
Average = Sum(39)m / 12 =	63.6280	63.4355	63.2431	62.2806	62.0881	61.1257	61.1257	60.9332	61.5107	62.0881	62.4731	62.8581 (39)		
												62.2325		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	0.6811	0.6790	0.6770	0.6667	0.6646	0.6543	0.6543	0.6523	0.6584	0.6646	0.6687	0.6729 (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												2.6697 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	79.5576	78.3761	76.7122	73.6444	71.3472	68.8000	67.4241	69.0763	70.8753	73.6009	76.7319	79.2886 (42c)
Average daily hot water use (litres/day)	41.9704	40.4442	38.9180	37.3918	35.8656	34.3394	34.3394	35.8656	37.3918	38.9180	40.4442	41.9704 (43)
												111.9173 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	121.5280	118.8203	115.6302	111.0362	107.2128	103.1394	101.7635	104.9419	108.2671	112.5189	117.1761	121.2590 (44)
Energy content (annual)	192.4706	169.1985	177.7193	152.0029	144.3290	126.8219	123.0741	129.9400	133.5041	152.6871	166.9388	189.8623 (45)
Distribution loss (46)m = 0.15 x (45)m	28.8706	25.3798	26.6579	22.8004	21.6494	19.0233	18.4611	19.4910	20.0256	22.9031	25.0408	28.4794 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.3000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7020 (55)
Enter (49) or (54) in (55)												0.7020 (55)
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	251.5306	222.5429	236.7793	209.1577	203.3890	183.9767	182.1341	189.0000	190.6589	211.7470	224.0936	248.9223 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	251.5306	222.5429	236.7793	209.1577	203.3890	183.9767	182.1341	189.0000	190.6589	211.7470	224.0936	248.9223 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2553.9322 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	111.2445	98.9341	106.3396	96.2648	95.2374	87.8921	88.1701	90.4530	90.1140	98.0164	101.2310	110.3772 (65)

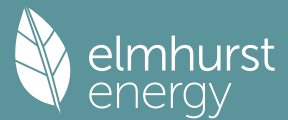
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.3790	155.4196	140.3790	145.0583	140.3790	145.0583	140.3790	140.3790	145.0583	140.3790	145.0583	140.3790 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.2309	247.7756	241.3630	227.7112	210.4784	194.2819	183.4616	180.9169	187.3296	200.9813	218.2142	234.4106 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880 (71)
Water heating gains (Table 5)	149.5221	147.2233	142.9296	133.7011	128.0072	122.0724	118.5082	121.5766	125.1583	131.7425	140.5986	148.3564 (72)
Total internal gains	598.1775	613.4640	587.7171	569.5161	541.9100	524.4581	505.3944	505.9181	520.5916	536.1483	566.9166	586.1916 (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						4.5400	10.6334	0.4500	0.8000	0.7700	12.0438 (74)	
East						1.2400	19.6403	0.4500	0.8000	0.7700	6.0758 (76)	
South						4.3500	46.7521	0.4500	0.8000	0.7700	50.7371 (78)	
Solar gains	68.8567	117.9962	164.5316	210.9991	244.2742	246.3795	235.8968	210.2287	180.3587	131.1262	82.5742	58.8783 (83)
Total gains	667.0342	731.4602	752.2487	780.5153	786.1843	770.8375	741.2912	716.1468	700.9503	667.2745	649.4908	645.0699 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	139.5991	140.0227	140.4489	142.6192	143.0614	145.3139	145.3139	145.7729	144.4044	143.0614	142.1798	141.3090
alpha	10.3066	10.3348	10.3633	10.5079	10.5374	10.6876	10.6876	10.7182	10.6270	10.5374	10.4787	10.4206
util living area												
	0.9969	0.9908	0.9742	0.8962	0.7267	0.5073	0.3628	0.3914	0.6043	0.8976	0.9875	0.9977 (86)
Living	20.6861	20.7582	20.8384	20.9316	20.9660	20.9707	20.9708	20.9709	20.9701	20.9369	20.8080	20.6755
Non living	20.0722	20.1447	20.2234	20.3140	20.3403	20.3521	20.3522	20.3541	20.3481	20.3209	20.2022	20.0685
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	20.8394	20.7582	20.8384	20.9316	20.9660	20.9707	20.9708	20.9709	20.9701	20.9369	20.8080	20.7209 (87)
Th 2	20.3576	20.3594	20.3612	20.3704	20.3722	20.3814	20.3814	20.3832	20.3777	20.3722	20.3685	20.3649 (88)
util rest of house												
	0.9957	0.9873	0.9647	0.8674	0.6808	0.4584	0.3118	0.3389	0.5504	0.8638	0.9821	0.9968 (89)
MIT 2	20.2116	20.1447	20.2234	20.3140	20.3403	20.3521	20.3522	20.3541	20.3481	20.3209	20.2022	20.1099 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.3314	20.2618	20.3408	20.4319	20.4597	20.4702	20.4702	20.4718	20.4668	20.4385	20.3178	20.2265 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3314	20.2618	20.3408	20.4319	20.4597	20.4702	20.4702	20.4718	20.4668	20.4385	20.3178	20.2265 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9956	0.9866	0.9644	0.8704	0.6873	0.4654	0.3191	0.3464	0.5582	0.8677	0.9816	0.9965 (94)
Useful gains	664.1127	721.6732	725.4652	679.3877	540.3740	358.7663	236.5710	248.1071	391.2719	578.9978	637.5322	642.8269 (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	1020.0481	974.4850	875.3343	718.2115	543.8761	358.8205	236.5718	248.1090	391.6279	610.8530	825.7601	1007.3970 (97)
Space heating kWh	264.8160	169.8896	111.5026	27.9532	2.6056	0.0000	0.0000	0.0000	0.0000	23.7003	135.5241	271.2401 (98a)
Space heating requirement - total per year (kWh/year)												1007.2314
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	264.8160	169.8896	111.5026	27.9532	2.6056	0.0000	0.0000	0.0000	0.0000	23.7003	135.5241	271.2401 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.2314
Space heating per m2										(98c) / (4) =		10.7818 (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 %)												270.3131 (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	264.8160	169.8896	111.5026	27.9532	2.6056	0.0000	0.0000	0.0000	0.0000	23.7003	135.5241	271.2401 (98)
Space heating efficiency (main heating system 1)	270.3131	270.3131	270.3131	270.3131	270.3131	0.0000	0.0000	0.0000	0.0000	270.3131	270.3131	270.3131 (210)
Space heating fuel (main heating system)	97.9664	62.8492	41.2494	10.3410	0.9639	0.0000	0.0000	0.0000	0.0000	8.7677	50.1360	100.3430 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	251.5306	222.5429	236.7793	209.1577	203.3890	183.9767	182.1341	189.0000	190.6589	211.7470	224.0936	248.9223 (64)
Efficiency of water heater	285.6781	285.6781	285.6781	285.6781	285.6781	285.6781	285.6781	285.6781	285.6781	285.6781	285.6781	285.6781 (216)
Fuel for water heating, kWh/month	88.0469	77.8999	82.8832	73.2145	71.1951	64.4000	63.7550	66.1584	66.7391	74.1208	78.4427	87.1338 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	22.6857	20.4903	22.6857	21.9539	22.6857	21.9539	22.6857	22.6857	21.9539	22.6857	21.9539	22.6857 (231)
Pumps and Fa	29.8437	23.9417	21.5568	15.7935	12.1993	9.9670	11.1286	14.4654	18.7891	24.6524	27.8448	30.6731 (232)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												372.6166 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.6781
Water heating fuel used												893.9894 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												267.1057 (230a)
Total electricity for the above, kWh/year												267.1057 (231)

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Electricity for lighting (calculated in Appendix L)	240.8554	(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	1774.5671	(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	372.6166	0.1585	59.0604	(261)
Total CO2 associated with community systems			0.0000	(273)
Water heating (other fuel)	893.9894	0.1408	125.8490	(264)
Space and water heating			184.9094	(265)
Pumps, fans and electric keep-hot	267.1057	0.1387	37.0509	(267)
Energy for lighting	240.8554	0.1443	34.7629	(268)
Total CO2, kg/year			256.7231	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7500	(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	372.6166	1.5867	591.2438	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	893.9894	1.5205	1359.3276	(278)
Space and water heating			1950.5714	(279)
Pumps, fans and electric keep-hot	267.1057	1.5128	404.0775	(281)
Energy for lighting	240.8554	1.5338	369.4320	(282)
Total Primary energy kWh/year			2724.0809	(286)
Dwelling Primary energy Rate (DPER)			29.1600	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	46.7100 (1b)	x 3.0000 (2b)	= 140.1300 (1b) - (3b)	
First floor	46.7100 (1c)	x 2.4000 (2c)	= 112.1040 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.4200			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.2340	(5)

2. Ventilation rate

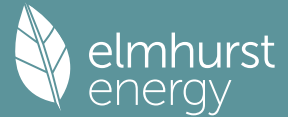
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1189 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3689	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3413 (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	0.4351	0.4266	0.4181	0.3754	0.3669	0.3242	0.3242	0.3157	0.3413	0.3669	0.3839	0.4010	(22b)
Effective ac	0.5947	0.5910	0.5874	0.5705	0.5673	0.5526	0.5526	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling	m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K	
TER Opaque door					2.2300		1.0000		2.2300				(26)	
TER Opening Type					10.1300		1.1450		11.5992				(27)	
Heatloss Floor 1					46.7100		0.1300		6.0723				(28a)	
00 Ext Wall	46.4400	7.4100			39.0300		0.1800		7.0254				(29a)	
01 Ext Wall	58.0500	4.9500			53.1000		0.1800		9.5580				(29a)	
Roof	46.7100				46.7100		0.1100		5.1381				(30)	
Total net area of external elements Aum(A, m2)					197.9100								(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =				41.6230				(33)	
Main dwelling														
Ground					21.7900		0.0000		0.0000				(32)	
First					20.7600		0.0000		0.0000				(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													342.2897 (35)	
List of Thermal Bridges														
K1 Element							Length		Psi-value		Total			
E1 Steel lintel with perforated steel base plate							9.7200		0.0500		0.4860			
E3 Sill							8.6600		0.0500		0.4330			
E4 Jamb							22.6600		0.0500		1.1330			
E5 Ground floor (normal)							19.3500		0.1600		3.0960			
E6 Intermediate floor within a dwelling							19.3500		0.0000		0.0000			
E16 Corner (normal)							10.8000		0.0900		0.9720			
E18 Party wall between dwellings							10.8000		0.0600		0.6480			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													6.7680 (36)	
Point Thermal bridges													0.0000	
Total fabric heat loss									(33) + (36) + (36a) =				48.3910 (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	(38)	
Heat transfer coeff	49.4981	49.1921	48.8922	47.4835	47.2200	45.9931	45.9931	45.7659	46.4656	47.2200	47.7531	48.3105	(38)	
Average = Sum(39)m / 12 =	97.8891	97.5831	97.2832	95.8746	95.6110	94.3841	94.3841	94.1569	94.8567	95.6110	96.1442	96.7016	(39)	
												95.8733	(39)	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)	
HLP (average)	1.0478	1.0446	1.0414	1.0263	1.0235	1.0103	1.0103	1.0079	1.0154	1.0235	1.0292	1.0351	(40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)	

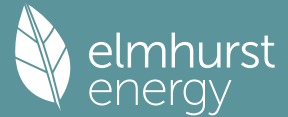
4. Water heating energy requirements (kWh/year)														

Assumed occupancy													2.6697 (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	79.5576	78.3761	76.7122	73.6444	71.3472	68.8000	67.4241	69.0763	70.8753	73.6009	76.7319	79.2886	(42b)	
Hot water usage for other uses	41.9704	40.4442	38.9180	37.3918	35.8656	34.3394	34.3394	35.8656	37.3918	38.9180	40.4442	41.9704	(42c)	
Average daily hot water use (litres/day)													111.9173 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	121.5280	118.8203	115.6302	111.0362	107.2128	103.1394	101.7635	104.9419	108.2671	112.5189	117.1761	121.2590	(44)	
Energy conte	192.4706	169.1985	177.7193	152.0029	144.3290	126.8219	123.0741	129.9400	133.5041	152.6871	166.9388	189.8623	(45)	
Energy content (annual)													Total = Sum(45)m = 1858.5488	
Distribution loss (46)m = 0.15 x (45)m														
	28.8706	25.3798	26.6579	22.8004	21.6494	19.0233	18.4611	19.4910	20.0256	22.9031	25.0408	28.4794	(46)	
Water storage loss (or HIU loss):														
Store volume													200.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)	
Temperature factor from Table 2b													0.5400 (49)	
Enter (49) or (54) in (55)													0.8924 (55)	
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)	
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month	243.3967	215.1962	228.6454	201.2862	195.2551	176.1052	174.0002	180.8661	182.7874	203.6131	216.2221	240.7884	(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	243.3967	215.1962	228.6454	201.2862	195.2551	176.1052	174.0002	180.8661	182.7874	203.6131	216.2221	240.7884	(64)	
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2458.1622 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
													0.0000 (64a)	
Heat gains from water heating, kWh/month	104.7373	93.0567	99.8325	89.9676	88.7303	81.5949	81.6630	83.9459	83.8168	91.5093	94.9338	103.8701	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	140.3790	155.4196	140.3790	145.0583	140.3790	145.0583	140.3790	140.3790	145.0583	140.3790	145.0583	140.3790	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	245.2309	247.7756	241.3630	227.7112	210.4784	194.2819	183.4616	180.9169	187.3296	200.9813	218.2142	234.4106	(68)	
Pumps, fans	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	(69)	
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Water heating gains (Table 5)	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	(71)	
Total internal gains	140.7760	138.4772	134.1835	124.9550	119.2611	113.3263	109.7621	112.8305	116.4122	122.9964	131.8525	139.6103	(72)	
	592.4314	607.7179	581.9710	563.7700	536.1639	515.7119	496.6482	497.1719	511.8455	530.4022	561.1705	580.4455	(73)	

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6b	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W
North	4.5400				10.6334		0.6300		0.7000	0.7700	14.7537 (74)
East	1.2400				19.6403		0.6300		0.7000	0.7700	7.4429 (76)
South	4.3500				46.7521		0.6300		0.7000	0.7700	62.1530 (78)
Solar gains	84.3495	144.5454	201.5513	258.4739	299.2359	301.8148	288.9736	257.5302	220.9394	160.6296	72.1259 (83)
Total gains	676.7809	752.2633	783.5222	822.2440	835.3999	817.5268	785.6219	754.7021	732.7849	691.0317	652.5714 (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	90.7396	91.0241	91.3047	92.6462	92.9016	94.1093	94.1093	94.3363	93.6404	92.9016	92.3864	91.8539
alpha	7.0493	7.0683	7.0870	7.1764	7.1934	7.2740	7.2740	7.2891	7.2427	7.1934	7.1591	7.1236
util living area												
	0.9988	0.9971	0.9931	0.9738	0.9035	0.7156	0.5262	0.5696	0.8237	0.9766	0.9967	0.9991 (86)
MIT	20.1359	20.2598	20.4294	20.6751	20.8785	20.9828	20.9983	20.9970	20.9539	20.7110	20.3889	20.1219 (87)
Th 2	20.0437	20.0464	20.0490	20.0615	20.0638	20.0747	20.0747	20.0768	20.0705	20.0638	20.0591	20.0542 (88)
util rest of house												
	0.9983	0.9958	0.9897	0.9604	0.8579	0.6236	0.4170	0.4579	0.7420	0.9618	0.9949	0.9987 (89)
MIT 2	19.0427	19.2030	19.4209	19.7362	19.9676	20.0667	20.0744	20.0760	20.0443	19.7851	19.3784	19.0330 (90)
Living area fraction												
	19.2514	19.4047	19.6134	19.9154	20.1414	20.2415	20.2507	20.2518	20.2179	19.9618	19.5713	19.2408 (92)
MIT	19.2514	19.4047	19.6134	19.9154	20.1414	20.2415	20.2507	20.2518	20.2179	19.9618	19.5713	19.2408 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2514	19.4047	19.6134	19.9154	20.1414	20.2415	20.2507	20.2518	20.2179	19.9618	19.5713	19.2408 (93)

8. Space heating requirement

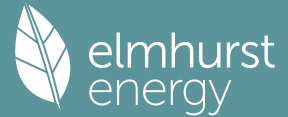
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9977	0.9946	0.9876	0.9578	0.8623	0.6410	0.4380	0.4794	0.7563	0.9597	0.9936	0.9982 (94)
Useful gains	675.1942	748.1950	773.7808	787.5538	720.3581	524.0199	344.0850	361.7700	554.2146	663.1963	658.0574	651.3770 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1463.5784	1415.4156	1275.7105	1056.1001	807.0916	532.4721	344.5674	362.6741	580.3219	895.0920	1199.0423	1454.4712 (97)
Space heating kWh	586.5579	448.3723	373.4357	193.3534	64.5297	0.0000	0.0000	0.0000	0.0000	172.5304	389.5091	597.5021 (98a)
Space heating requirement - total per year (kWh/year)												2825.7905
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	586.5579	448.3723	373.4357	193.3534	64.5297	0.0000	0.0000	0.0000	0.0000	172.5304	389.5091	597.5021 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2825.7905
Space heating per m2										(98c) / (4) =		30.2482 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	586.5579	448.3723	373.4357	193.3534	64.5297	0.0000	0.0000	0.0000	0.0000	172.5304	389.5091	597.5021	(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)	635.4906	485.7771	404.5890	209.4836	69.9130	0.0000	0.0000	0.0000	0.0000	186.9235	422.0034	647.3479	(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	243.3967	215.1962	228.6454	201.2862	195.2551	176.1052	174.0002	180.8661	182.7874	203.6131	216.2221	240.7884	(64)
Efficiency of water heater	85.9570	85.6667	85.1529	83.9697	81.8609	79.8000	79.8000	79.8000	79.8000	83.6906	85.3634	79.8000	(216)
Fuel for water heating, kWh/month	283.1611	251.2017	268.5115	239.7130	238.5206	220.6832	218.0454	226.6492	229.0569	243.2927	253.2961	279.9424	(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	29.1680	23.3996	21.0688	15.4359	11.9231	9.7413	10.8767	14.1379	18.3638	24.0942	27.2144	29.9787	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-43.0953	-60.4286	-86.3686	-96.5092	-103.5267	-96.4056	-95.2068	-90.1606	-81.1489	-68.8352	-47.2616	-37.2964	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.2973	-53.1256	-105.4409	-158.1551	-208.9326	-209.8874	-207.4221	-175.7025	-128.8866	-75.9039	-33.7502	-20.0111	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	3061.5282	1.1300	3459.5268 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2952.0738	1.1300	3335.8434 (278)
Space and water heating			6795.3703 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	235.4023	1.5338	361.0680 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-906.2434	1.4979	-1357.4594
PV Unit electricity exported	-1402.5154	0.4623	-648.3329
Total			-2005.7923 (283)
Total Primary energy kWh/year			5280.7468 (286)
Target Primary Energy Rate (TPER)			56.5300 (287)

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Plot Reference	Plot 02			Issued on Date	17/12/2025
Assessment Reference	Plot 02	Plot Type Ref			
Plot Address				SAP Version	10.2
SAP Rating	89 B	DER	2.41	TER	9.13
Environmental	98 A	% DER < TER			73.60
CO ₂ Emissions (t/year)	0.21	DFEE	26.65	TFEE	27.99
Compliance Check	See BREL	% DFEE < TFEE			4.78
% DPER < TPER	45.84	DPER	25.74	TPER	47.53
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	46.7100 (1b)	x 2.4000 (2b)	= 112.1040 (1b) - (3b)
First floor	46.7100 (1c)	x 3.0000 (2c)	= 140.1300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	252.2340 (5)

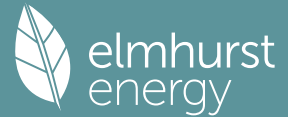
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.0000 (17)
Infiltration rate	0.1000 (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) = 0.0850 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.1084 0.1063 0.1041 0.0935 0.0914 0.0808 0.0808 0.0786 0.0850 0.0914 0.0956 0.0999 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)
Effective ac	0.1899 0.1877 0.1856 0.1750 0.1729 0.1622 0.1622 0.1601 0.1665 0.1729 0.1771 0.1814 (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							
Glazing			8.8900	0.7752	6.8915		(27)
Front Door			2.2300	1.0000	2.2300		(26)
Heatloss Floor 1			46.7100	0.0800	3.7368	75.0000	3503.2500 (28a)
00 Ext Wall	24.4800	6.1700	18.3100	0.1000	1.8310	190.0000	3478.8999 (29a)
01 Ext Wall	30.6000	4.9500	25.6500	0.1000	2.5650	190.0000	4873.5001 (29a)
Roof	46.7100		46.7100	0.0900	4.2039	9.0000	420.3900 (30)
Total net area of external elements Aum(A, m ²)			148.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.4582		(33)
Main dwelling							
Ground			43.5800	0.0000	0.0000	180.0000	7844.4003 (32)
First			54.5800	0.0000	0.0000	180.0000	9824.4003 (32)
00 Internal Wall			84.1900			9.0000	757.7100 (32c)
01 Internal Wall			96.7200			9.0000	870.4800 (32c)
Internal Floor 1			46.7100			18.0000	840.7800 (32d)

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Ground	46.7100								9.0000			420.3900 (32e)		
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) =					32834.2007 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													351.4687 (35)	
Thermal bridges (User defined value 0.100 * total exposed area)													14.8500 (36)	
Point Thermal bridges								(36a) =					0.0000	
Total fabric heat loss								(33) + (36) + (36a) =					36.3082 (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		
	15.8047	15.6278	15.4509	14.5665	14.3896	13.5052	13.5052	13.3284	13.8590	14.3896	14.7434	15.0972	(38)	
Heat transfer coeff	52.1128	51.9360	51.7591	50.8747	50.6978	49.8134	49.8134	49.6365	50.1672	50.6978	51.0516	51.4053	(39)	
Average = Sum(39)m / 12 =													50.8305	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.5578	0.5559	0.5540	0.5446	0.5427	0.5332	0.5332	0.5313	0.5370	0.5427	0.5465	0.5503	(40)	
HLP (average)														
Days in mont	31	28	31	30	31	30	31	31	30	31	30			
												0.5441		
												31		

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6697 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	79.5576	78.3761	76.7122	73.6444	71.3472	68.8000	67.4241	69.0763	70.8753	73.6009	76.7319	79.2886 (42c)
Average daily hot water use (litres/day)	41.9704	40.4442	38.9180	37.3918	35.8656	34.3394	34.3394	35.8656	37.3918	38.9180	40.4442	41.9704 (43)
												111.9173 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	121.5280	118.8203	115.6302	111.0362	107.2128	103.1394	101.7635	104.9419	108.2671	112.5189	117.1761	121.2590 (44)
Energy content (annual)	192.4706	169.1985	177.7193	152.0029	144.3290	126.8219	123.0741	129.9400	133.5041	152.6871	166.9388	189.8623 (45)
Distribution loss (46)m = 0.15 x (45)m	28.8706	25.3798	26.6579	22.8004	21.6494	19.0233	18.4611	19.4910	20.0256	22.9031	25.0408	28.4794 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.3000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7020 (55)
Enter (49) or (54) in (55)												0.7020 (55)
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	251.5306	222.5429	236.7793	209.1577	203.3890	183.9767	182.1341	189.0000	190.6589	211.7470	224.0936	248.9223 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	251.5306	222.5429	236.7793	209.1577	203.3890	183.9767	182.1341	189.0000	190.6589	211.7470	224.0936	248.9223 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2553.9322 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	111.2445	98.9341	106.3396	96.2648	95.2374	87.8921	88.1701	90.4530	90.1140	98.0164	101.2310	110.3772 (65)

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

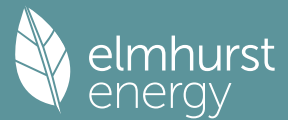
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	144.3096	159.7714	144.3096	149.1199	144.3096	149.1199	144.3096	144.3096	149.1199	144.3096	149.1199	144.3096 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.2309	247.7756	241.3630	227.7112	210.4784	194.2819	183.4616	180.9169	187.3296	200.9813	218.2142	234.4106 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880 (71)
Water heating gains (Table 5)	149.5221	147.2233	142.9296	133.7011	128.0072	122.0724	118.5082	121.5766	125.1583	131.7425	140.5986	148.3564 (72)
Total internal gains	602.1081	617.8158	591.6477	573.5778	545.8407	528.5197	509.3250	509.8487	524.6533	540.0789	570.9782	590.1222 (73)

6. Solar gains

[Jan]													
				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a		Specific data		Specific data		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
North				4.5400	10.6334		0.4500		0.8000		0.7700		12.0438 (74)
South				4.3500	46.7521		0.4500		0.8000		0.7700		50.7371 (78)
Solar gains	62.7809	106.1106	144.9578	182.4518	209.2884	210.5652	201.8003	180.9403	157.5934	117.0229	74.9984		53.8818 (83)
Total gains	664.8890	723.9264	736.6055	756.0296	755.1291	739.0850	711.1252	690.7889	682.2467	657.1018	645.9766		644.0040 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	175.0166	175.6126	176.2128	179.2760	179.9015	183.0955	183.0955	183.7480	181.8044	179.9015	178.6549	177.4254
alpha	12.6678	12.7075	12.7475	12.9517	12.9934	13.2064	13.2064	13.2499	13.1203	12.9934	12.9103	12.8284
util living area	0.9920	0.9750	0.9356	0.8030	0.6239	0.4313	0.3082	0.3305	0.5073	0.7929	0.9634	0.9940 (86)
Living	20.8259	20.8829	20.9320	20.9699	20.9757	20.9763	20.9764	20.9764	20.9762	20.9715	20.9138	20.8169
Non living	20.3122	20.3682	20.4139	20.4523	20.4577	20.4668	20.4668	20.4686	20.4632	20.4553	20.4054	20.3100
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	20.9109	20.8829	20.9320	20.9699	20.9757	20.9763	20.9764	20.9764	20.9762	20.9715	20.9138	20.8425 (87)
Th 2	20.4681	20.4698	20.4715	20.4801	20.4819	20.4905	20.4905	20.4922	20.4870	20.4819	20.4784	20.4750 (88)
util rest of house	0.9891	0.9671	0.9184	0.7722	0.5893	0.3970	0.2725	0.2940	0.4696	0.7570	0.9511	0.9918 (89)
MIT 2	20.3884	20.3682	20.4139	20.4523	20.4577	20.4668	20.4668	20.4686	20.4632	20.4553	20.4054	20.3331 (90)
Living area fraction									fLA = Living area / (4) =			0.1909 (91)
MIT	20.4881	20.4665	20.5128	20.5510	20.5566	20.5641	20.5641	20.5655	20.5611	20.5538	20.5025	20.4303 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4881	20.4665	20.5128	20.5510	20.5566	20.5641	20.5641	20.5655	20.5611	20.5538	20.5025	20.4303 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9892	0.9671	0.9199	0.7765	0.5943	0.4020	0.2777	0.2993	0.4751	0.7621	0.9517	0.9915 (94)
Useful gains	657.7086	700.0758	677.5786	587.0748	448.7954	297.0897	197.4640	206.7632	324.1263	500.7481	614.7743	638.5490 (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	843.6077	808.4595	725.2894	592.7431	449.0077	297.0908	197.4640	206.7632	324.1361	504.6359	684.2172	834.3260 (97)
Space heating kWh	138.3089	72.8338	35.4969	4.0812	0.1579	0.0000	0.0000	0.0000	0.0000	2.8925	49.9989	145.6581 (98a)
Space heating requirement - total per year (kWh/year)												449.4284
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	138.3089	72.8338	35.4969	4.0812	0.1579	0.0000	0.0000	0.0000	0.0000	2.8925	49.9989	145.6581 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												449.4284
Space heating per m2										(98c) / (4) =		4.8108 (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 %)												263.6252 (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	138.3089	72.8338	35.4969	4.0812	0.1579	0.0000	0.0000	0.0000	0.0000	2.8925	49.9989	145.6581 (98)
Space heating efficiency (main heating system 1)	263.6252	263.6252	263.6252	263.6252	263.6252	0.0000	0.0000	0.0000	0.0000	263.6252	263.6252	263.6252 (210)
Space heating fuel (main heating system)	52.4642	27.6278	13.4649	1.5481	0.0599	0.0000	0.0000	0.0000	0.0000	1.0972	18.9659	55.2520 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	251.5306	222.5429	236.7793	209.1577	203.3890	183.9767	182.1341	189.0000	190.6589	211.7470	224.0936	248.9223 (64)
Efficiency of water heater	287.7459	287.7459	287.7459	287.7459	287.7459	287.7459	287.7459	287.7459	287.7459	287.7459	287.7459	287.7459 (216)
Fuel for water heating, kWh/month	87.4141	77.3401	82.2876	72.6883	70.6835	63.9372	63.2969	65.6829	66.2595	73.5882	77.8790	86.5077 (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	22.6857	20.4903	22.6857	21.9539	22.6857	21.9539	22.6857	22.6857	21.9539	22.6857	21.9539	22.6857 (231)
Lighting	30.6793	24.6121	22.1604	16.2357	12.5409	10.2460	11.4402	14.8704	19.3152	25.3426	28.6245	31.5319 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												170.4800 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												287.7459
Water heating fuel used												887.5651 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												267.1057 (230a)
Total electricity for the above, kWh/year												267.1057 (231)
Electricity for lighting (calculated in Appendix L)												247.5993 (232)

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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	1572.7502 (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	170.4800	0.1600	27.2807 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	887.5651	0.1408	124.9446 (264)
Space and water heating			152.2253 (265)
Pumps, fans and electric keep-hot	267.1057	0.1387	37.0509 (267)
Energy for lighting	247.5993	0.1443	35.7362 (268)
Total CO2, kg/year			225.0124 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4100 (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	170.4800	1.5923	271.4527 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	887.5651	1.5205	1349.5594 (278)
Space and water heating			1621.0121 (279)
Pumps, fans and electric keep-hot	267.1057	1.5128	404.0775 (281)
Energy for lighting	247.5993	1.5338	379.7761 (282)
Total Primary energy kWh/year			2404.8657 (286)
Dwelling Primary energy Rate (DPER)			25.7400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	46.7100 (1b)	x 2.4000 (2b)	= 112.1040 (1b) - (3b)
First floor	46.7100 (1c)	x 3.0000 (2c)	= 140.1300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.2340 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1189 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3689 (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) = 0.3136 (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	0.3998	0.3920	0.3842	0.3450	0.3371	0.2979	0.2979	0.2901	0.3136	0.3371	0.3528	0.3685 (22b)
Effective ac	0.5799	0.5768	0.5738	0.5595	0.5568	0.5444	0.5444	0.5421	0.5492	0.5568	0.5622	0.5679 (25)

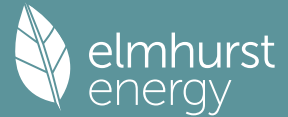
3. Heat losses and heat loss parameter

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							

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849	133.4849 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	144.3096	159.7714	144.3096	149.1199	144.3096	149.1199	144.3096	144.3096	149.1199	144.3096	149.1199	144.3096 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.2309	247.7756	241.3630	227.7112	210.4784	194.2819	183.4616	180.9169	187.3296	200.9813	218.2142	234.4106 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485	36.3485 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880	-106.7880 (71)
Water heating gains (Table 5)	140.7760	138.4772	134.1835	124.9550	119.2611	113.3263	109.7621	112.8305	116.4122	122.9964	131.8525	139.6103 (72)
Total internal gains	596.3620	612.0697	585.9016	567.8317	540.0946	519.7736	500.5789	501.1026	515.9072	534.3328	565.2321	584.3761 (73)

Page 5 of 7

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d			Gains W
North				4.5400	10.6334	0.6300		0.7000	0.7700			14.7537 (74)
South				4.3500	46.7521	0.6300		0.7000	0.7700			62.1530 (78)

Solar gains	76.9066	129.9855	177.5733	223.5035	256.3783	257.9424	247.2053	221.6518	193.0520	143.3531	91.8730	66.0053 (83)
Total gains	673.2686	742.0552	763.4748	791.3351	796.4729	777.7160	747.7842	722.7544	708.9591	677.6859	657.1051	650.3813 (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	107.8575	108.1880	108.5140	110.0718	110.3682	111.7694	111.7694	112.0328	111.2255	110.3682	109.7701	109.1518
alpha	8.1905	8.2125	8.2343	8.3381	8.3579	8.4513	8.4513	8.4689	8.4150	8.3579	8.3180	8.2768
util living area	0.9988	0.9968	0.9920	0.9671	0.8765	0.6637	0.4796	0.5172	0.7706	0.9674	0.9960	0.9991 (86)
MIT	20.3349	20.4445	20.5848	20.7861	20.9365	20.9945	20.9997	20.9994	20.9824	20.8162	20.5491	20.3210 (87)
Th 2	20.1631	20.1655	20.1678	20.1786	20.1806	20.1901	20.1901	20.1918	20.1864	20.1806	20.1765	20.1722 (88)
util rest of house	0.9982	0.9954	0.9881	0.9514	0.8279	0.5839	0.3917	0.4269	0.6927	0.9488	0.9939	0.9987 (89)
MIT 2	19.3909	19.5326	19.7124	19.9685	20.1327	20.1877	20.1900	20.1917	20.1772	20.0085	19.6754	19.3806 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5711	19.7067	19.8789	20.1245	20.2861	20.3417	20.3445	20.3458	20.3309	20.1627	19.8421	19.5601 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5711	19.7067	19.8789	20.1245	20.2861	20.3417	20.3445	20.3458	20.3309	20.1627	19.8421	19.5601 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9977	0.9943	0.9864	0.9502	0.8349	0.5991	0.4085	0.4442	0.7073	0.9483	0.9927	0.9982 (94)
Useful gains	671.7106	737.8174	753.0758	751.9197	664.9426	465.9382	305.4682	321.0459	501.4374	642.6409	652.3326	649.2237 (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	1291.3481	1248.2509	1124.5002	930.0714	709.5415	468.5311	305.5620	321.2318	510.9379	790.2406	1058.7211	1283.4733 (97)
Space heating kWh	461.0103	343.0113	276.3398	128.2692	33.1816	0.0000	0.0000	0.0000	0.0000	109.8142	292.5997	471.8817 (98a)
Space heating requirement - total per year (kWh/year)	2116.1078											
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	461.0103	343.0113	276.3398	128.2692	33.1816	0.0000	0.0000	0.0000	0.0000	109.8142	292.5997	471.8817 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2116.1078											
Space heating per m2	(98c) / (4) = 22.6516 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	461.0103	343.0113	276.3398	128.2692	33.1816	0.0000	0.0000	0.0000	0.0000	109.8142	292.5997	471.8817 (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)	499.4694	371.6266	299.3930	138.9699	35.9497	0.0000	0.0000	0.0000	0.0000	118.9753	317.0095	511.2478 (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	243.3967	215.1962	228.6454	201.2862	195.2551	176.1052	174.0002	180.8661	182.7874	203.6131	216.2221	240.7884 (64)
Efficiency of water heater (217)m	85.4693	85.0999	84.4857	83.0772	80.9924	79.8000	79.8000	79.8000	79.8000	82.7380	84.7388	79.8000 (216)
Fuel for water heating, kWh/month	284.7769	252.8747	270.6319	242.2881	241.0784	220.6832	218.0454	226.6492	229.0569	246.0938	255.1631	281.4907 (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	29.9847	24.0548	21.6587	15.8681	12.2570	10.0141	11.1812	14.5338	18.8779	24.7689	27.9764	30.8181 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-43.1207	-60.4718	-86.4346	-96.5818	-103.5986	-96.4694	-95.2781	-90.2426	-81.2318	-68.8998	-47.2962	-37.3182 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-25.2719	-53.0823	-105.3749	-158.0825	-208.8607	-209.8235	-207.3507	-175.6205	-128.8037	-75.8394	-33.7156	-19.9894 (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												

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Space heating fuel - main system 1	2292.6412 (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	2968.8324 (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)	241.9936 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2308.7587 (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	3280.7085 (238)

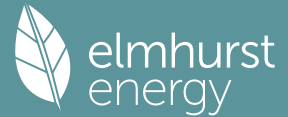
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2292.6412	0.2100	481.4546 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2968.8324	0.2100	623.4548 (264)
Space and water heating			1104.9095 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	241.9936	0.1443	34.9272 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-906.9435	0.1347	-122.1795
PV Unit electricity exported	-1401.8152	0.1259	-176.5296
Total			-298.7090 (269)
Total CO2, kg/year			853.0568 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.1300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2292.6412	1.1300	2590.6845 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2968.8324	1.1300	3354.7806 (278)
Space and water heating			5945.4652 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	241.9936	1.5338	371.1779 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-906.9435	1.4979	-1358.5049
PV Unit electricity exported	-1401.8152	0.4622	-647.9867
Total			-2006.4916 (283)
Total Primary energy kWh/year			4440.2522 (286)
Target Primary Energy Rate (TPER)			47.5300 (287)

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Plot Reference	Plot 04			Issued on Date	17/12/2025
Assessment Reference	Plot 04	Plot Type Ref	Plot 04		
Plot Address				SAP Version	10.2
SAP Rating	88 B	DER	2.99	TER	12.18
Environmental	98 A	% DER < TER			75.45
CO ₂ Emissions (t/year)	0.21	DFEE	35.64	TFEE	39.05
Compliance Check	See BREL	% DFEE < TFEE			8.74
% DPER < TPER	50.17	DPER	31.74	TPER	63.70
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.8100 (1b)	x 2.4000 (2b)	= 95.5440 (1b) - (3b)
First floor	39.8100 (1c)	x 3.0000 (2c)	= 119.4300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.9740 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.0000 (17)
Infiltration rate	0.1000 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.0925 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.1179 0.1156 0.1133 0.1018 0.0994 0.0879 0.0879 0.0856 0.0925 0.0994 0.1041 0.1087 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)
Effective ac	0.1994 0.1971 0.1948 0.1832 0.1809 0.1694 0.1694 0.1671 0.1740 0.1809 0.1856 0.1902 (25)

3. Heat losses and heat loss parameter

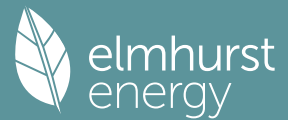
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Glazing			12.7800	0.7752	9.9070		(27)
Solid Front Door			2.1100	1.0000	2.1100		(26)
Heatloss Floor 1			39.8100	0.0800	3.1848	75.0000	2985.7500 (28a)
Gable	20.2700		20.2700	0.1000	2.0270	190.0000	3851.3001 (29a)
00 Ext Wall	42.5200		32.5600	0.1000	3.2560	190.0000	6186.4001 (29a)
01 Ext Wall	42.5200	4.9300	37.5900	0.1000	3.7590	190.0000	7142.1001 (29a)
Roof	39.8100		39.8100	0.0900	3.5829	9.0000	358.2900 (30)
Total net area of external elements Aum (A, m ²)			184.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8267		(33)
Main dwelling							
00 Party Wall			21.7200	0.0000	0.0000	180.0000	3909.5999 (32)
01 Party Wall			27.1500	0.0000	0.0000	180.0000	4886.9999 (32)
00 Internal Wall			70.6100			9.0000	635.4900 (32c)
01 Internal Wall			92.7000			9.0000	834.3000 (32c)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.4556 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	75.4016	74.2818	72.7049	69.7973	67.6201	65.2060	63.9020	65.4679	67.1729	69.7561	72.7236	75.1467 (42b)
Hot water usage for other uses	39.7779	38.3314	36.8850	35.4385	33.9920	32.5456	32.5456	33.9920	35.4385	36.8850	38.3314	39.7779 (42c)
Average daily hot water use (litres/day)												106.0709 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.1796	112.6133	109.5899	105.2358	101.6121	97.7515	96.4475	99.4599	102.6114	106.6411	111.0550	114.9246 (44)
Energy content (annual)	182.4163	160.3598	168.4355	144.0625	136.7895	120.1969	116.6449	123.1522	126.5301	144.7109	158.2182	179.9442 (45)
Distribution loss (46)m = 0.15 x (45)m	27.3624	24.0540	25.2653	21.6094	20.5184	18.0295	17.4967	18.4728	18.9795	21.7066	23.7327	26.9916 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.3000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7020 (55)
Enter (49) or (54) in (55)												
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980 (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	241.4762	213.7043	227.4955	201.2173	195.8494	177.3517	175.7049	182.2121	183.6849	203.7709	215.3730	239.0042 (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	241.4762	213.7043	227.4955	201.2173	195.8494	177.3517	175.7049	182.2121	183.6849	203.7709	215.3730	239.0042 (64)
12Total per year (kWh/year)												2456.8444 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	107.9014	95.9952	103.2528	93.6246	92.7305	85.6893	86.0324	88.1961	87.7951	95.3643	98.3314	107.0794 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	114.9816	127.3010	114.9816	118.8143	114.9816	118.8143	114.9816	114.9816	118.8143	114.9816	118.8143	114.9816 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.6445	220.9134	215.1959	203.0242	187.6596	173.2191	163.5719	161.3031	167.0205	179.1922	194.5568	208.9973 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781 (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)	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245 (71)
Water heating gains (Table 5)	145.0287	142.8500	138.7806	130.0342	124.6377	119.0129	115.6350	118.5431	121.9376	128.1779	136.5714	143.9240 (72)
Total internal gains	538.4890	550.8986	528.7923	511.7069	487.1131	470.8805	454.0226	454.6619	467.6066	482.1858	509.7766	527.7370 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
North					6.9400	10.6334	0.4500	0.8000	0.7700			18.4106 (74)
East					1.4000	19.6403	0.4500	0.8000	0.7700			6.8598 (76)
South					4.4400	46.7521	0.4500	0.8000	0.7700			51.7869 (78)
Solar gains	77.0572	133.4163	189.9223	250.3672	296.1039	301.3742	287.4344	251.8370	210.4419	149.2838	92.6502	65.7377 (83)
Total gains	615.5462	684.3148	718.7146	762.0742	783.2171	772.2547	741.4570	706.4989	678.0485	631.4696	602.4269	593.4748 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	146.3817	146.7799	147.1803	149.2155	149.6293	151.7332	151.7332	152.1612	150.8846	149.6293	148.8040	147.9877
alpha	10.7588	10.7853	10.8120	10.9477	10.9753	11.1155	11.1155	11.1441	11.0590	10.9753	10.9203	10.8658
util living area	0.9981	0.9931	0.9758	0.8863	0.6980	0.4834	0.3462	0.3787	0.5962	0.9040	0.9912	0.9987 (86)
Living	20.6866	20.7615	20.8483	20.9410	20.9691	20.9719	20.9719	20.9720	20.9714	20.9396	20.8060	20.6745
Non living	20.0057	20.0811	20.1657	20.2532	20.2735	20.2840	20.2840	20.2859	20.2801	20.2552	20.1334	20.0004
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	20.8397	20.7615	20.8483	20.9410	20.9691	20.9719	20.9719	20.9720	20.9714	20.9396	20.8060	20.7200 (87)
Th 2	20.2886	20.2904	20.2922	20.3012	20.3030	20.3121	20.3121	20.3139	20.3084	20.3030	20.2994	20.2958 (88)
util rest of house	0.9972	0.9899	0.9653	0.8519	0.6478	0.4315	0.2921	0.3223	0.5369	0.8664	0.9865	0.9980 (89)
MIT 2	20.1439	20.0811	20.1657	20.2532	20.2735	20.2840	20.2840	20.2859	20.2801	20.2552	20.1334	20.0417 (90)
Living area fraction									FLA = Living area / (4) =			0.1586 (91)
MIT	20.2543	20.1890	20.2740	20.3623	20.3838	20.3931	20.3931	20.3947	20.3898	20.3638	20.2401	20.1493 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2543	20.1890	20.2740	20.3623	20.3838	20.3931	20.3931	20.3947	20.3898	20.3638	20.2401	20.1493 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9893	0.9649	0.8551	0.6537	0.4376	0.2984	0.3289	0.5439	0.8700	0.9860	0.9978 (94)
Useful gains	613.7654	677.0157	693.5104	651.6757	511.9592	337.9233	221.2727	232.3770	368.7783	549.3700	594.0094	592.1789 (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	964.7229	921.9904	828.3655	679.9394	513.6962	337.9428	221.2730	232.3776	368.9795	577.5819	781.6198	953.9571 (97)
Space heating kWh	261.1124	164.6230	100.3322	20.3499	1.2923	0.0000	0.0000	0.0000	0.0000	20.9896	135.0795	269.1631 (98a)
Space heating requirement - total per year (kWh/year)												972.9419
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	261.1124	164.6230	100.3322	20.3499	1.2923	0.0000	0.0000	0.0000	0.0000	20.9896	135.0795	269.1631 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												972.9419
Space heating per m2										(98c) / (4) =		12.2198 (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 %)												268.9771 (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	261.1124	164.6230	100.3322	20.3499	1.2923	0.0000	0.0000	0.0000	0.0000	20.9896	135.0795	269.1631 (98)
Space heating efficiency (main heating system 1)	268.9771	268.9771	268.9771	268.9771	268.9771	0.0000	0.0000	0.0000	0.0000	268.9771	268.9771	268.9771 (210)
Space heating fuel (main heating system)	97.0761	61.2033	37.3014	7.5657	0.4805	0.0000	0.0000	0.0000	0.0000	7.8035	50.2197	100.0691 (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	241.4762	213.7043	227.4955	201.2173	195.8494	177.3517	175.7049	182.2121	183.6849	203.7709	215.3730	239.0042 (64)
Efficiency of water heater	285.9876	285.9876	285.9876	285.9876	285.9876	285.9876	285.9876	285.9876	285.9876	285.9876	285.9876	285.9876 (216)
Fuel for water heating, kWh/month	84.4359	74.7250	79.5473	70.3588	68.4818	62.0138	61.4379	63.7133	64.2283	71.2517	75.3085	83.5715 (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	19.3346	17.4635	19.3346	18.7109	19.3346	18.7109	19.3346	19.3346	18.7109	19.3346	18.7109	19.3346 (231)
Lighting	24.4443	19.6101	17.6568	12.9361	9.9922	8.1637	9.1152	11.8483	15.3898	20.1923	22.8071	25.1237 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												361.7192 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.9876
Water heating fuel used												859.0738 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												227.6489 (230a)

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Total electricity for the above, kWh/year	227.6489	(231)
Electricity for lighting (calculated in Appendix L)	197.2797	(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	1645.7216	(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	361.7192	0.1588	57.4241 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	859.0738	0.1407	120.9077 (264)
Space and water heating			178.3317 (265)
Pumps, fans and electric keep-hot	227.6489	0.1387	31.5777 (267)
Energy for lighting	197.2797	0.1443	28.4736 (268)
Total CO2, kg/year			238.3830 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	361.7192	1.5876	574.2808 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	859.0738	1.5204	1306.1398 (278)
Space and water heating			1880.4206 (279)
Pumps, fans and electric keep-hot	227.6489	1.5128	344.3872 (281)
Energy for lighting	197.2797	1.5338	302.5942 (282)
Total Primary energy kWh/year			2527.4020 (286)
Dwelling Primary energy Rate (DPER)			31.7400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.8100 (1b)	x 2.4000 (2b)	= 95.5440 (1b) - (3b)
First floor	39.8100 (1c)	x 3.0000 (2c)	= 119.4300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	214.9740 (5)

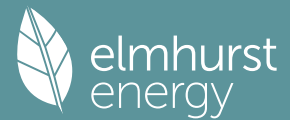
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1396 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3896 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3603 (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	0.4594	0.4504	0.4414	0.3964	0.3874	0.3423	0.3423	0.3333	0.3603	0.3874	0.4054	0.4234 (22b)
Effective ac	0.6055	0.6014	0.5974	0.5786	0.5750	0.5586	0.5586	0.5555	0.5649	0.5750	0.5822	0.5896 (25)

3. Heat losses and heat loss parameter

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Element	Gross		Openings	NetArea		U-value		A x U		K-value	A x K	
Main dwelling	m2		m2	m2		W/m2K		W/K		kJ/m2K	kJ/K	
TER Opaque door				2.1100		1.0000		2.1100				(26)
TER Opening Type				12.7800		1.1450		14.6336				(27)
Heatloss Floor 1				39.8100		0.1300		5.1753				(28a)
Gable	20.2700			20.2700		0.1800		3.6486				(29a)
00 Ext Wall	42.5200		9.9600	32.5600		0.1800		5.8608				(29a)
01 Ext Wall	42.5200		4.9300	37.5900		0.1800		6.7662				(29a)
Roof	39.8100			39.8100		0.1100		4.3791				(30)
Total net area of external elements Aum(A, m2)				184.9300								(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =				42.5736				(33)
Main dwelling												
00 Party Wall				21.7200		0.0000		0.0000				(32)
01 Party Wall				27.1500		0.0000		0.0000				(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												400.2148 (35)
List of Thermal Bridges												
K1 Element							Length		Psi-value		Total	
E2 Other lintels (including other steel lintels)							10.5700		0.0500		0.5285	
E3 Sill							9.5600		0.0500		0.4780	
E4 Jamb							22.1200		0.0500		1.1060	
E5 Ground floor (normal)							17.7200		0.1600		2.8352	
E6 Intermediate floor within a dwelling							17.7200		0.0000		0.0000	
E16 Corner (normal)							10.8000		0.0900		0.9720	
E18 Party wall between dwellings							10.8000		0.0600		0.6480	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												6.5677 (36)
Point Thermal bridges												(36a) = 0.0000
Total fabric heat loss												(33) + (36) + (36a) = 49.1413 (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
	42.9576	42.6669	42.3820	41.0435	40.7930	39.6272	39.6272	39.4114	40.0763	40.7930	41.2996	41.8293 (38)
Heat transfer coeff	92.0989	91.8082	91.5232	90.1847	89.9343	88.7685	88.7685	88.5526	89.2176	89.9343	90.4409	90.9706 (39)
Average = Sum(39)m / 12 =												90.1835
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1567	1.1531	1.1495	1.1327	1.1295	1.1149	1.1149	1.1122	1.1205	1.1295	1.1359	1.1426 (40)
HLP (average)												1.1327
Days in mont												31

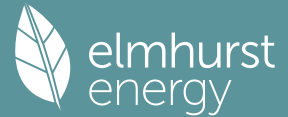
4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.4556 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	75.4016	74.2818	72.7049	69.7973	67.6201	65.2060	63.9020	65.4679	67.1729	69.7561	72.7236	75.1467 (42b)
Hot water usage for other uses												
	39.7779	38.3314	36.8850	35.4385	33.9920	32.5456	32.5456	33.9920	35.4385	36.8850	38.3314	39.7779 (42c)
Average daily hot water use (litres/day)												106.0709 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.1796	112.6133	109.5899	105.2358	101.6121	97.7515	96.4475	99.4599	102.6114	106.6411	111.0550	114.9246 (44)
Energy conte	182.4163	160.3598	168.4355	144.0625	136.7895	120.1969	116.6449	123.1522	126.5301	144.7109	158.2182	179.9442 (45)
Energy content (annual)												Total = Sum(45)m = 1761.4610
Distribution loss (46)m = 0.15 x (45)m												
	27.3624	24.0540	25.2653	21.6094	20.5184	18.0295	17.4967	18.4728	18.9795	21.7066	23.7327	26.9916 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.6525 (48)
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss												
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage												
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	233.3423	206.3575	219.3616	193.3458	187.7155	169.4802	167.5710	174.0782	175.8134	195.6370	207.5015	230.8703 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	233.3423	206.3575	219.3616	193.3458	187.7155	169.4802	167.5710	174.0782	175.8134	195.6370	207.5015	230.8703 (64)
Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2361.0745 (64)
Electric shower(s)												2361 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	101.3943	90.1178	96.7457	87.3274	86.2234	79.3921	79.5253	81.6889	81.4979	88.8572	92.0342	100.5723 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806	122.7806 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	114.9816	127.3010	114.9816	118.8143	114.9816	118.8143	114.9816	114.9816	118.8143	114.9816	118.8143	114.9816 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	218.6445	220.9134	215.1959	203.0242	187.6596	173.2191	163.5719	161.3031	167.0205	179.1922	194.5568	208.9973 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781	35.2781 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245	-98.2245 (71)
Water heating gains (Table 5)												
	136.2826	134.1039	130.0345	121.2881	115.8916	110.2668	106.8888	109.7970	113.1915	119.4318	127.8253	135.1778 (72)
Total internal gains												
	532.7429	545.1525	523.0462	505.9608	481.3670	462.1344	445.2765	445.9158	458.8605	476.4397	504.0305	521.9909 (73)

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	6.9400		10.6334		0.6300		0.7000		0.7700		22.5529 (74)	
East	1.4000		19.6403		0.6300		0.7000		0.7700		8.4032 (76)	
South	4.4400		46.7521		0.6300		0.7000		0.7700		63.4389 (78)	
Solar gains	94.3951	163.4349	232.6548	306.6999	362.7273	369.1834	352.1071	308.5003	257.7913	182.8726	113.4965	80.5287 (83)
Total gains	627.1380	708.5874	755.7010	812.6607	844.0943	831.3178	797.3836	754.4161	716.6518	659.3123	617.5271	602.5196 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	96.1077	96.4120	96.7122	98.1476	98.4209	99.7135	99.7135	99.9565	99.2116	98.4209	97.8696	97.2998
alpha	7.4072	7.4275	7.4475	7.5432	7.5614	7.6476	7.6476	7.6638	7.6141	7.5614	7.5246	7.4867
util living area	0.9992	0.9978	0.9934	0.9699	0.8791	0.6712	0.4888	0.5377	0.8068	0.9779	0.9976	0.9994 (86)
MIT	20.1688	20.2964	20.4739	20.7228	20.9137	20.9907	20.9992	20.9985	20.9658	20.7341	20.4138	20.1539 (87)
Th 2	19.9548	19.9577	19.9606	19.9742	19.9768	19.9887	19.9887	19.9909	19.9841	19.9768	19.9716	19.9662 (88)
util rest of house	0.9988	0.9966	0.9897	0.9525	0.8208	0.5718	0.3771	0.4212	0.7129	0.9614	0.9960	0.9991 (89)
MIT 2	19.0005	19.1659	19.3936	19.7105	19.9162	19.9852	19.9886	19.9906	19.9675	19.7308	19.3274	18.9905 (90)
Living area fraction	19.1858	19.3453	19.5650	19.8711	20.0745	20.1447	20.1489	20.1505	20.1259	19.8900	19.4997	0.1586 (91)
MIT	19.1858	19.3453	19.5650	19.8711	20.0745	20.1447	20.1489	20.1505	20.1259	19.8900	19.4997	19.1751 (92)
Temperature adjustment	19.1858	19.3453	19.5650	19.8711	20.0745	20.1447	20.1489	20.1505	20.1259	19.8900	19.4997	0.0000
adjusted MIT	19.1858	19.3453	19.5650	19.8711	20.0745	20.1447	20.1489	20.1505	20.1259	19.8900	19.4997	19.1751 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9955	0.9877	0.9503	0.8271	0.5876	0.3949	0.4398	0.7272	0.9595	0.9949	0.9988 (94)
Useful gains	626.0993	705.4335	746.3879	772.2390	698.1599	488.5057	314.8714	331.7688	521.1809	632.5991	614.3928	601.7709 (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	1370.9697	1326.1942	1195.7493	989.4257	753.1509	492.1920	315.0284	332.1147	537.6139	835.4884	1121.4430	1362.2893 (97)
Space heating kWh	554.1835	417.1512	334.3249	156.3744	40.9134	0.0000	0.0000	0.0000	0.0000	150.9496	365.0761	565.8256 (98a)
Space heating requirement - total per year (kWh/year)												2584.7988
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	554.1835	417.1512	334.3249	156.3744	40.9134	0.0000	0.0000	0.0000	0.0000	150.9496	365.0761	565.8256 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2584.7988
Space heating per m2										(98c) / (4) =		32.4642 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	554.1835	417.1512	334.3249	156.3744	40.9134	0.0000	0.0000	0.0000	0.0000	150.9496	365.0761	565.8256 (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)	600.4155	451.9515	362.2155	169.4198	44.3265	0.0000	0.0000	0.0000	0.0000	163.5424	395.5321	613.0289 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	233.3423	206.3575	219.3616	193.3458	187.7155	169.4802	167.5710	174.0782	175.8134	195.6370	207.5015	230.8703 (64)
Efficiency of water heater	85.9285	85.6047	85.0019	83.5881	81.2741	79.8000	79.8000	79.8000	79.8000	83.4852	85.3131	79.8000 (216)
Fuel for water heating, kWh/month	271.5540	241.0587	258.0667	231.3079	230.9661	212.3812	209.9887	218.1431	220.3175	234.3374	243.2236	268.4862 (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	23.8909	19.1662	17.2570	12.6432	9.7660	7.9789	8.9089	11.5801	15.0414	19.7351	22.2907	24.5549 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-37.1214	-52.2679	-75.0361	-84.2591	-90.7655	-84.6843	-83.6342	-78.9989	-70.8048	-59.7134	-40.7860	-32.1012 (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)	-21.1683	-44.5120	-88.4393	-132.7862	-175.5373	-176.3631	-174.2903	-147.5909	-108.2042	-63.6449	-28.2587	-16.7409 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)										
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(235d)
Annual totals kWh/year										
Space heating fuel - main system 1									2800.4321	(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									2839.8311	(219)
Space cooling fuel									0.0000	(221)
Electricity for pumps and fans:										
Total electricity for the above, kWh/year									86.0000	(231)
Electricity for lighting (calculated in Appendix L)									192.8132	(232)
Energy saving/generation technologies (Appendices M ,N and Q)										
PV generation									-1967.7091	(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									3951.3673	(238)

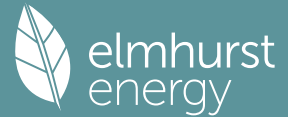
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2800.4321	0.2100	588.0907 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2839.8311	0.2100	596.3645 (264)
Space and water heating			1184.4553 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	192.8132	0.1443	27.8289 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-790.1728	0.1346	-106.3681
PV Unit electricity exported	-1177.5362	0.1259	-148.2581
Total			-254.6261 (269)
Total CO2, kg/year			969.5873 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.1800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2800.4321	1.1300	3164.4882 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2839.8311	1.1300	3209.0091 (278)
Space and water heating			6373.4974 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	192.8132	1.5338	295.7434 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-790.1728	1.4975	-1183.2923
PV Unit electricity exported	-1177.5362	0.4622	-544.2095
Total			-1727.5018 (283)
Total Primary energy kWh/year			5071.8397 (286)
Target Primary Energy Rate (TPER)			63.7000 (287)

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Plot Reference	Plot 08				Issued on Date	17/12/2025	
Assessment Reference	Plot 08			Plot Type Ref	Plot 08		
Plot Address					SAP Version	10.2	
SAP Rating	87 B	DER	3.09	TER	12.56		
Environmental	97 A	% DER < TER				75.40	
CO ₂ Emissions (t/year)	0.26	DFEE	39.73	TFEE	44.48		
Compliance Check	See BREL	% DFEE < TFEE				10.69	
% DPER < TPER	50.39	DPER	32.63	TPER	65.76		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	46.4900 (1b)	x 2.4000 (2b)	= 111.5760 (1b) - (3b)
First floor	46.4900 (1c)	x 3.0000 (2c)	= 139.4700 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 251.0460 (5)

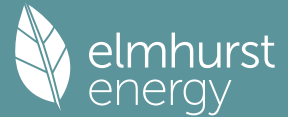
2. Ventilation rate

											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											2.0000 (17)		
Infiltration rate											0.1000 (18)		
Number of sides sheltered											0 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1000 (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)	
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	0.1275	0.1250	0.1225	0.1100	0.1075	0.0950	0.0950	0.0925	0.1000	0.1075	0.1125	0.1175 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													83.7000 (23c)
Effective ac	0.2090	0.2065	0.2040	0.1915	0.1890	0.1765	0.1765	0.1740	0.1815	0.1890	0.1940	0.1990 (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							
Glazing			18.4200	0.7752	14.2791		(27)
Front Door			2.1800	1.0000	2.1800		(26)
Heatloss Floor 1			46.4900	0.0800	3.7192	75.0000	3486.7500 (28a)
00 External Wall	68.2500	12.8900	55.3600	0.1000	5.5360	190.0000	10518.4000 (29a)
01 External Wall	85.3200	7.7100	77.6100	0.1000	7.7610	190.0000	14745.8999 (29a)
Roof	46.4900		46.4900	0.0900	4.1841	9.0000	418.4100 (30)
Total net area of external elements Aum(A, m ²)			246.5500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6594		(33)
Main dwelling							
00 Internal Wall			93.7900			9.0000	844.1100 (32c)
01 Internal Wall			97.0200			9.0000	873.1800 (32c)
Internal Floor 1			46.4900			18.0000	836.8200 (32d)
00 Internal Ceiling			46.4900			9.0000	418.4100 (32e)
01 Internal Ceiling			46.4900			9.0000	418.4100 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
Thermal bridges (User defined value $0.100 \times \text{total exposed area}$)
Point Thermal bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 32560.3899 (34)
350.1870 (35)
24.6550 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 62.3144 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.3146	17.1075	16.9004	15.8649	15.6577	14.6222	14.6222	14.4151	15.0364	15.6577	16.0720	16.4862
Heat transfer coeff	79.6290	79.4219	79.2148	78.1792	77.9721	76.9365	76.9365	76.7294	77.3508	77.9721	78.3863	78.8006
Average = $\text{Sum}(39)\text{m} / 12 =$												
	78.1274											
HLP	0.8564	0.8542	0.8520	0.8408	0.8386	0.8275	0.8275	0.8252	0.8319	0.8386	0.8430	0.8475
HLP (average)												0.8403
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6644 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													79.4538 (42b)
Hot water usage for other uses													41.9156 (42c)
Average daily hot water use (litres/day)													111.7713 (43)
Daily hot water use													
Energy conte	121.3694	118.6652	115.4793	110.8913	107.0729	103.0048	101.6307	104.8050	108.1258	112.3721	117.0232	121.1008	(44)
Energy content (annual)	192.2195	168.9777	177.4875	151.8046	144.1407	126.6564	122.9136	129.7705	133.3300	152.4878	166.7210	189.6146	(45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$													1856.1241
Water storage loss (or HIU loss):	28.8329	25.3467	26.6231	22.7707	21.6211	18.9985	18.4370	19.4656	19.9995	22.8732	25.0082	28.4422	(46)
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7020 (55)
Total storage loss													
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(56)
Primary loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(57)
Combi loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	(59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
WWHRS	251.2795	222.3222	236.5474	208.9594	203.2007	183.8112	181.9735	188.8305	190.4848	211.5478	223.8758	248.6746	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
12Total per year (kWh/year)	251.2795	222.3222	236.5474	208.9594	203.2007	183.8112	181.9735	188.8305	190.4848	211.5478	223.8758	248.6746	(64)
Electric shower(s)													2551.5075 (64)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = $\text{Sum}(64a)\text{m} =$													0.0000 (64a)
	111.1610	98.8607	106.2625	96.1989	95.1748	87.8371	88.1167	90.3967	90.0561	97.9502	101.1586	110.2948	(65)

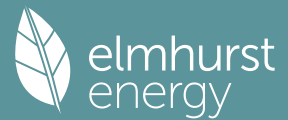
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.2946	137.6119	124.2946	128.4378	124.2946	128.4378	124.2946	124.2946	128.4378	124.2946	128.4378	124.2946	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4546	246.9913	240.5989	226.9904	209.8121	193.6669	182.8809	180.3442	186.7366	200.3451	217.5234	233.6686	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	(71)
Water heating gains (Table 5)	149.4099	147.1141	142.8260	133.6096	127.9231	121.9960	118.4365	121.5009	125.0779	131.6535	140.4980	148.2457	(72)
Total internal gains	581.1244	594.6825	570.6848	552.0030	524.9950	507.0659	488.5773	489.1050	503.2175	519.2584	549.4245	569.1742	(73)

6. Solar gains

[Jan]													
			Area	Solar flux	g	FF	Access	Gains					
			m ²	Table 6a	Specific data	Specific data	factor	W					
				W/m ²	or Table 6b	or Table 6c	Table 6d						
North			5.8800	10.6334	0.4500	0.8000	0.7700	15.5986	(74)				
East			2.5600	19.6403	0.4500	0.8000	0.7700	12.5436	(76)				
South			6.6100	46.7521	0.4500	0.8000	0.7700	77.0971	(78)				
West			3.3700	19.6403	0.4500	0.8000	0.7700	16.5125	(80)				
Solar gains	121.7518	212.9148	305.1006	399.6673	466.3445	470.9070	450.7234	399.9536	337.7874	239.1187	146.8588	103.5171	(83)
Total gains	702.8762	807.5973	875.7855	951.6703	991.3395	977.9729	939.3006	889.0586	841.0048	758.3772	696.2833	672.6913	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	113.5836	113.8798	114.1776	115.6900	115.9973	117.5586	117.5586	117.8759	116.9291	115.9973	115.3843	114.7778
alpha	8.5722	8.5920	8.6118	8.7127	8.7332	8.8372	8.8372	8.8584	8.7953	8.7332	8.6923	8.6519
util living area												
	0.9980	0.9928	0.9752	0.8943	0.7180	0.5029	0.3604	0.3969	0.6303	0.9246	0.9925	0.9986 (86)
Living	20.5336	20.6372	20.7621	20.8992	20.9552	20.9644	20.9647	20.9648	20.9621	20.8891	20.6909	20.5171
Non living	19.7812	19.8853	20.0076	20.1378	20.1797	20.1942	20.1943	20.1963	20.1894	20.1340	19.9474	19.7717
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	20.7614	20.6372	20.7621	20.8992	20.9552	20.9644	20.9647	20.9648	20.9621	20.8891	20.6909	20.5846 (87)
Th 2	20.2047	20.2066	20.2085	20.2181	20.2200	20.2296	20.2296	20.2315	20.2258	20.2200	20.2162	20.2124 (88)
util rest of house												
	0.9971	0.9898	0.9652	0.8615	0.6633	0.4427	0.2973	0.3307	0.5618	0.8923	0.9888	0.9980 (89)
MIT 2	19.9881	19.8853	20.0076	20.1378	20.1797	20.1942	20.1943	20.1963	20.1894	20.1340	19.9474	19.8333 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.1359	20.0290	20.1518	20.2833	20.3279	20.3414	20.3416	20.3432	20.3371	20.2783	20.0895	19.9769 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1359	20.0290	20.1518	20.2833	20.3279	20.3414	20.3416	20.3432	20.3371	20.2783	20.0895	19.9769 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9890	0.9644	0.8645	0.6711	0.4515	0.3065	0.3403	0.5718	0.8950	0.9881	0.9977 (94)
Useful gains	700.7937	798.6842	844.5962	822.7065	665.2452	441.5086	287.8585	302.5460	480.8871	678.7667	687.9827	671.1674 (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	1260.9952	1201.5764	1081.4237	889.9359	672.7354	441.7243	287.8643	302.5602	482.4443	754.6353	1018.2020	1243.2306 (97)
Space heating kWh	416.7899	270.7435	176.1997	48.4052	5.5727	0.0000	0.0000	0.0000	0.0000	56.4463	237.7579	425.6150 (98a)
Space heating requirement - total per year (kWh/year)												1637.5302
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	416.7899	270.7435	176.1997	48.4052	5.5727	0.0000	0.0000	0.0000	0.0000	56.4463	237.7579	425.6150 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1637.5302
Space heating per m2										(98c) / (4) =		17.6116 (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 %)												274.1076 (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	416.7899	270.7435	176.1997	48.4052	5.5727	0.0000	0.0000	0.0000	0.0000	56.4463	237.7579	425.6150 (98)
Space heating efficiency (main heating system 1)	274.1076	274.1076	274.1076	274.1076	274.1076	0.0000	0.0000	0.0000	0.0000	274.1076	274.1076	274.1076 (210)
Space heating fuel (main heating system)	152.0534	98.7727	64.2812	17.6592	2.0330	0.0000	0.0000	0.0000	0.0000	20.5927	86.7389	155.2730 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	251.2795	222.3222	236.5474	208.9594	203.2007	183.8112	181.9735	188.8305	190.4848	211.5478	223.8758	248.6746 (64)
Efficiency of water heater												285.8301 (216)
(217)m	285.8301	285.8301	285.8301	285.8301	285.8301	285.8301	285.8301	285.8301	285.8301	285.8301	285.8301	285.8301 (217)
Fuel for water heating, kWh/month	87.9122	77.7812	82.7581	73.1062	71.0914	64.3079	63.6649	66.0639	66.6427	74.0117	78.3248	87.0009 (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	22.5788	20.3938	22.5788	21.8505	22.5788	21.8505	22.5788	22.5788	21.8505	22.5788	21.8505	22.5788 (221)
Lighting	26.4242	21.1985	19.0869	13.9839	10.8015	8.8250	9.8535	12.8080	16.6363	21.8277	24.6544	27.1586 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												597.4042 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.8301
Water heating fuel used												892.6659 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												265.8477 (230a)
Total electricity for the above, kWh/year												265.8477 (231)

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Electricity for lighting (calculated in Appendix L)	213.2586 (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	1969.1763 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	597.4042	0.1581	94.4247 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	892.6659	0.1408	125.6620 (264)
Space and water heating			220.0867 (265)
Pumps, fans and electric keep-hot	265.8477	0.1387	36.8764 (267)
Energy for lighting	213.2586	0.1443	30.7798 (268)
Total CO2, kg/year			287.7428 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	597.4042	1.5851	946.9377 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	892.6659	1.5205	1357.3127 (278)
Space and water heating			2304.2504 (279)
Pumps, fans and electric keep-hot	265.8477	1.5128	402.1744 (281)
Energy for lighting	213.2586	1.5338	327.1031 (282)
Total Primary energy kWh/year			3033.5279 (286)
Dwelling Primary energy Rate (DPER)			32.6300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	46.4900 (1b)	x 2.4000 (2b)	= 111.5760 (1b) - (3b)
First floor	46.4900 (1c)	x 3.0000 (2c)	= 139.4700 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 251.0460 (5)

2. Ventilation rate

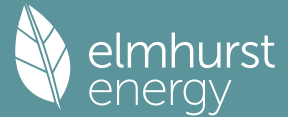
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1195 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3695 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3695 (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	0.4711	0.4619	0.4526	0.4065	0.3972	0.3510	0.3510	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6024	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5942 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
---------	-------	----------	---------	---------	-------	---------	-------

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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opaque door			2.1800	1.0000	2.1800		(26)
TER Opening Type			18.4200	1.1450	21.0916		(27)
Heatloss Floor 1			46.4900	0.1300	6.0437		(28a)
00 External Wall	68.2500	12.8900	55.3600	0.1800	9.9648		(29a)
01 External Wall	85.3200	7.7100	77.6100	0.1800	13.9698		(29a)
Roof	46.4900		46.4900	0.1100	5.1139		(30)
Total net area of external elements Aum(A, m2)			246.5500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		58.3638		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 350.1870 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	16.1800	0.0500	0.8090
E3 Sill	15.1400	0.0500	0.7570
E4 Jamb	32.5200	0.0500	1.6260
E5 Ground floor (normal)	20.4400	0.1600	3.2704
E6 Intermediate floor within a dwelling	20.4400	0.0000	0.0000
E16 Corner (normal)	21.6000	0.0900	1.9440
E11 Eaves (insulation at rafter level)	23.2000	0.0400	0.9280
E13 Gable (insulation at rafter level)	8.6000	0.0800	0.6880

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.0224 (36)
Point Thermal bridges 0.0000
Total fabric heat loss (33) + (36) + (36a) = 68.3862 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	50.6162	50.2592	49.9093	48.2657	47.9582	46.5266	46.5266	46.2615	47.0780	47.9582	48.5803	49.2306
Heat transfer coeff	119.0024	118.6454	118.2955	116.6519	116.3444	114.9128	114.9128	114.6477	115.4642	116.3444	116.9665	117.6168
Average = Sum(39)m / 12 =												116.6504

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2799	1.2760	1.2723	1.2546	1.2513	1.2359	1.2359	1.2330	1.2418	1.2513	1.2580	1.2650
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

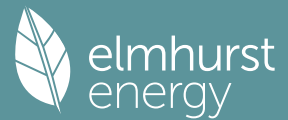
Assumed occupancy												2.6644
Hot water usage for mixer showers												(42)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
79.4538	78.2738	76.6121	73.5483	71.2541	68.7102	67.3361	68.9862	70.7828	73.5049	76.6318	79.1852	(42b)
Hot water usage for other uses												
41.9156	40.3914	38.8672	37.3430	35.8188	34.2946	34.2946	35.8188	37.3430	38.8672	40.3914	41.9156	(42c)
Average daily hot water use (litres/day)												111.7713
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	121.3694	118.6652	115.4793	110.8913	107.0729	103.0048	101.6307	104.8050	108.1258	112.3721	117.0232	121.1008
Energy conte	192.2195	168.9777	177.4875	151.8046	144.1407	126.6564	122.9136	129.7705	133.3300	152.4878	166.7210	189.6146
Energy content (annual)												(45)
Distribution loss (46)m = 0.15 x (45)m												1856.1241
28.8329	25.3467	26.6231	22.7707	21.6211	18.9985	18.4370	19.4656	19.9995	22.8732	25.0082	28.4422	(46)
Water storage loss (or HIU loss):												
Store volume												200.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.6525
Temperature factor from Table 2b												(48)
Enter (49) or (54) in (55)												0.5400
Total storage loss												(49)
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637
If cylinder contains dedicated solar storage												(56)
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637
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
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
Total heat required for water heating calculated for each month												(61)
243.1456	214.9755	228.4135	201.0879	195.0668	175.9397	173.8396	180.6966	182.6133	203.4139	216.0043	240.5407	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
243.1456	214.9755	228.4135	201.0879	195.0668	175.9397	173.8396	180.6966	182.6133	203.4139	216.0043	240.5407	(64)
12Total per year (kWh/year)												2455.7375
Electric shower(s)												(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
Heat gains from water heating, kWh/month												(64a)
104.6539	92.9833	99.7554	89.9017	88.6676	81.5399	81.6096	83.8895	83.7589	91.4431	94.8614	103.7877	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176	133.2176
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												(66)
124.2946	137.6119	124.2946	128.4378	124.2946	128.4378	124.2946	124.2946	128.4378	124.2946	128.4378	124.2946	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												(67)
244.4546	246.9913	240.5989	226.9904	209.8121	193.6669	182.8809	180.3442	186.7366	200.3451	217.5234	233.6686	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												(68)
36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	36.3218	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												(70)
-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	-106.5741	(71)
Water heating gains (Table 5)												(71)
140.6638	138.3680	134.0799	124.8634	119.1769	113.2499	109.6904	112.7548	116.3317	122.9073	131.7519	139.4996	(72)
Total internal gains												(72)
575.3783	588.9364	564.9387	546.2569	519.2489	498.3198	479.8311	480.3589	494.4713	513.5123	543.6784	563.4281	(73)

6. Solar gains

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[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North			5.8800	10.6334	0.6300	0.7000	0.7700	19.1083 (74)
East			2.5600	19.6403	0.6300	0.7000	0.7700	15.3659 (76)
South			6.6100	46.7521	0.6300	0.7000	0.7700	94.4439 (78)
West			3.3700	19.6403	0.6300	0.7000	0.7700	20.2278 (80)

Solar gains	149.1459	260.8206	373.7483	489.5925	571.2720	576.8611	552.1361	489.9432	413.7895	292.9205	179.9020	126.8084 (83)
Total gains	724.5242	849.7570	938.6870	1035.8494	1090.5209	1075.1809	1031.9673	970.3021	908.2609	806.4328	723.5804	690.2365 (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	76.0031	76.2318	76.4573	77.5346	77.7395	78.7079	78.7079	78.8899	78.3321	77.7395	77.3260	76.8985
alpha	6.0669	6.0821	6.0972	6.1690	6.1826	6.2472	6.2472	6.2593	6.2221	6.1826	6.1551	6.1266
util living area	0.9986	0.9960	0.9884	0.9557	0.8574	0.6625	0.4870	0.5380	0.7993	0.9713	0.9962	0.9990 (86)
MIT	19.9130	20.0845	20.3220	20.6362	20.8731	20.9800	20.9974	20.9954	20.9388	20.6316	20.2193	19.8913 (87)
Th 2	19.8566	19.8597	19.8626	19.8766	19.8792	19.8914	19.8914	19.8937	19.8867	19.8792	19.8739	19.8684 (88)
util rest of house	0.9979	0.9941	0.9826	0.9339	0.7959	0.5584	0.3661	0.4118	0.7033	0.9525	0.9940	0.9985 (89)
MIT 2	18.6115	18.8325	19.1353	19.5298	19.7865	19.8829	19.8909	19.8926	19.8541	19.5341	19.0162	18.5925 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8602	19.0718	19.3621	19.7413	19.9942	20.0926	20.1024	20.1034	20.0614	19.7438	19.2461	18.8408 (92)
Temperature adjustment												
adjusted MIT	18.8602	19.0718	19.3621	19.7413	19.9942	20.0926	20.1024	20.1034	20.0614	19.7438	19.2461	18.8408 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9921	0.9792	0.9306	0.8031	0.5782	0.3893	0.4362	0.7201	0.9494	0.9922	0.9978 (94)
Useful gains	722.3939	843.0827	919.1351	963.9415	875.7672	621.6169	401.7814	423.2280	654.0058	765.6614	717.9534	688.7064 (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	1732.6996	1681.4194	1521.5265	1264.6576	964.9818	631.1691	402.4666	424.5843	688.3329	1063.8346	1420.6876	1721.9995 (97)
Space heating kWh	751.6674	563.3623	448.1792	216.5156	66.3757	0.0000	0.0000	0.0000	0.0000	221.8408	505.9686	768.7700 (98a)
Space heating requirement - total per year (kWh/year)	3542.6796											
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	751.6674	563.3623	448.1792	216.5156	66.3757	0.0000	0.0000	0.0000	0.0000	221.8408	505.9686	768.7700 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3542.6796											
Space heating per m2	(98c) / (4) = 38.1015 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	751.6674	563.3623	448.1792	216.5156	66.3757	0.0000	0.0000	0.0000	0.0000	221.8408	505.9686	768.7700 (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)	814.3742	610.3600	485.5679	234.5781	71.9130	0.0000	0.0000	0.0000	0.0000	240.3476	548.1783	832.9036 (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	243.1456	214.9755	228.4135	201.0879	195.0668	175.9397	173.8396	180.6966	182.6133	203.4139	216.0043	240.5407 (64)
Efficiency of water heater (217)m	86.4179	86.1174	85.5430	84.2259	81.9076	79.8000	79.8000	79.8000	79.8000	84.2547	85.9014	79.8000 (216)
Fuel for water heating, kWh/month	281.3604	249.6306	267.0161	238.7484	238.1547	220.4759	217.8442	226.4368	228.8387	241.4275	251.4560	278.1600 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	25.8260	20.7185	18.6548	13.6673	10.5570	8.6252	9.6304	12.5180	16.2597	21.3336	24.0962	26.5437 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-42.8086	-60.0052	-85.7603	-95.8500	-102.8572	-95.8003	-94.5767	-89.5000	-80.5069	-68.2995	-46.9236	-37.0481 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.2619	-53.0141	-105.1459	-157.6149	-208.1305	-209.0500	-206.6268	-175.1109	-128.5393	-75.7580	-33.7066	-19.9895 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3838.2227	(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												2939.5491	(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)												208.4303	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2297.8848	(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												4774.3173	(238)

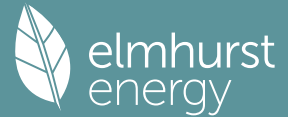
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3838.2227	0.2100	806.0268	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2939.5491	0.2100	617.3053	(264)
Space and water heating			1423.3321	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	208.4303	0.1443	30.0829	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-899.9365	0.1347	-121.2366	
PV Unit electricity exported	-1397.9483	0.1259	-176.0710	
Total			-297.3076	(269)
Total CO2, kg/year			1168.0367	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3838.2227	1.1300	4337.1917	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2939.5491	1.1300	3321.6905	(278)
Space and water heating			7658.8822	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	208.4303	1.5338	319.6974	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-899.9365	1.4979	-1348.0130	
PV Unit electricity exported	-1397.9483	0.4623	-646.3047	
Total			-1994.3177	(283)
Total Primary energy kWh/year			6114.3627	(286)
Target Primary Energy Rate (TPER)			65.7600	(287)

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Plot Reference	Plot 14			Issued on Date	17/12/2025
Assessment Reference	Plot 14	Plot Type Ref	Plot 14		
Plot Address				SAP Version	10.2
SAP Rating	88 B	DER	2.86	TER	11.53
Environmental	98 A	% DER < TER			75.20
CO ₂ Emissions (t/year)	0.2	DFEE	32.44	TFEE	36.23
Compliance Check	See BREL	% DFEE < TFEE			10.47
% DPER < TPER	49.53	DPER	30.38	TPER	60.19
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4900 (1b)	x 2.4000 (2b)	= 94.7760 (1b) - (3b)
First floor	39.4900 (1c)	x 3.0000 (2c)	= 118.4700 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.2460 (5)

2. Ventilation rate

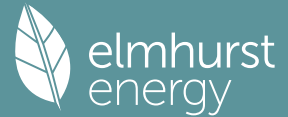
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.0000 (17)
Infiltration rate	0.1000 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.0925 (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	0.1179	0.1156	0.1133	0.1018	0.0994	0.0879	0.0879	0.0856	0.0925	0.0994	0.1041	0.1087 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												83.7000 (23c)
Effective ac	0.1994	0.1971	0.1948	0.1832	0.1809	0.1694	0.1694	0.1671	0.1740	0.1809	0.1856	0.1902 (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							
Glazing			12.8200	0.7752	9.9380		(27)
Front Door			2.1800	1.0000	2.1800		(26)
Heatloss Floor 1			39.4900	0.0800	3.1592	75.0000	2961.7500 (28a)
00 External Wall	42.3600	10.1300	32.2300	0.1000	3.2230	190.0000	6123.7001 (29a)
01 External Wall	42.3600	4.8700	37.4900	0.1000	3.7490	190.0000	7123.1001 (29a)
Roof	39.4900		39.4900	0.0900	3.5541	9.0000	355.4100 (30)
Total net area of external elements A _{um} (A, m ²)			163.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.8033		(33)
Main dwelling							
00 Party Wall			21.6000	0.0000	0.0000	180.0000	3888.0001 (32)
01 Party Wall			27.0000	0.0000	0.0000	180.0000	4860.0000 (32)
00 Internal Wall			70.2700			9.0000	632.4300 (32c)
01 Internal Wall			91.9200			9.0000	827.2800 (32c)
Internal Floor 1			39.4900			18.0000	710.8200 (32d)

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00 Internal Ceiling	39.4900						9.0000				355.4100 (32e)	
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =				27837.9003 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											352.4677 (35)	
Thermal bridges (User defined value 0.100 * total exposed area)											16.3700 (36)	
Point Thermal bridges											(36a) = 0.0000	
Total fabric heat loss							(33) + (36) + (36a) =				42.1733 (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	14.0347	13.8719	13.7092	12.8955	12.7328	11.9191	11.9191	11.7564	12.2446	12.7328	13.0583	13.3837 (38)
Average = Sum(39)m / 12 =	56.2079	56.0452	55.8825	55.0688	54.9061	54.0924	54.0924	53.9297	54.4179	54.9061	55.2315	55.5570 (39)
												55.0281
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7117	0.7096	0.7076	0.6972	0.6952	0.6849	0.6849	0.6828	0.6890	0.6952	0.6993	0.7034 (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											2.4432 (42)	
Hot water usage for mixer showers											0.0000 (42a)	
Hot water usage for baths											75.1611 74.0449 72.4730 69.5747 67.4044 64.9980 63.6981 65.2591 66.9586 69.5336 72.4916 74.9070 (42b)	
Hot water usage for other uses											39.6510 38.2092 36.7673 35.3255 33.8836 32.4418 32.4418 33.8836 35.3255 36.7673 38.2092 39.6510 (42c)	
Average daily hot water use (litres/day)											105.7326 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.8122	112.2541	109.2403	104.9001	101.2880	97.4397	96.1399	99.1427	102.2841	106.3009	110.7008	114.5581 (44)
Energy content (annual)	181.8344	159.8483	167.8983	143.6030	136.3532	119.8135	116.2729	122.7593	126.1265	144.2493	157.7136	179.3703 (45)
Distribution loss (46)m = 0.15 x (45)m											Total = Sum(45)m = 1755.8427	
Water storage loss (or HIU loss):											27.2752 23.9772 25.1847 21.5405 20.4530 17.9720 17.4409 18.4139 18.9190 21.6374 23.6570 26.9055 (46)	
Store volume											200.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):											1.3000 (48)	
Temperature factor from Table 2b											0.5400 (49)	
Enter (49) or (54) in (55)											0.7020 (55)	
Total storage loss											21.7620 19.6560 21.7620 21.0600 21.7620 21.0600 21.7620 21.7620 21.0600 21.7620 21.0600 21.7620 (56)	
If cylinder contains dedicated solar storage											21.7620 19.6560 21.7620 21.0600 21.7620 21.0600 21.7620 21.7620 21.0600 21.7620 21.0600 21.7620 (57)	
Primary loss											37.2980 33.6885 37.2980 36.0948 37.2980 36.0948 37.2980 37.2980 36.0948 37.2980 36.0948 37.2980 (59)	
Combi loss											0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)	
Total heat required for water heating calculated for each month											240.8944 213.1928 226.9582 200.7578 195.4131 176.9683 175.3328 181.8193 183.2813 203.3093 214.8684 238.4302 (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											240.8944 213.1928 226.9582 200.7578 195.4131 176.9683 175.3328 181.8193 183.2813 203.3093 214.8684 238.4302 (64)	
12Total per year (kWh/year)											Total per year (kWh/year) = Sum(64)m = 2451.2261 (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											107.7079 95.8251 103.0741 93.4718 92.5854 85.5618 85.9087 88.0655 87.6609 95.2109 98.1636 106.8886 (65)	

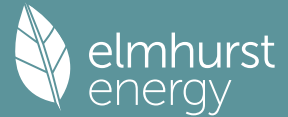
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.1611	122.1611	122.1611	122.1611	122.1611	122.1611	122.1611	122.1611	122.1611	122.1611	122.1611	122.1611 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											114.0227 126.2394 114.0227 117.8235 114.0227 117.8235 114.0227 114.0227 117.8235 114.0227 117.8235 114.0227 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											217.2955 219.5504 213.8683 201.7716 186.5018 172.1504 162.5627 160.3079 165.9900 178.0866 193.3564 207.7079 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											35.2161 35.2161 35.2161 35.2161 35.2161 35.2161 35.2161 35.2161 35.2161 35.2161 35.2161 35.2161 (69)	
Pumps, fans											0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)											-97.7289 -97.7289 -97.7289 -97.7289 -97.7289 -97.7289 -97.7289 -97.7289 -97.7289 -97.7289 -97.7289 -97.7289 (71)	
Water heating gains (Table 5)											144.7687 142.5969 138.5405 129.8220 124.4427 118.8359 115.4687 118.3675 121.7513 127.9716 136.3383 143.6675 (72)	
Total internal gains											535.7353 548.0351 526.0798 509.0655 484.6156 468.4581 451.7025 452.3465 465.2131 479.7293 507.1666 525.0464 (73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	4.4800	19.6403	0.4500	0.8000	0.7700	21.9513 (76)
South	1.3200	46.7521	0.4500	0.8000	0.7700	15.3961 (78)
West	7.0200	19.6403	0.4500	0.8000	0.7700	34.3970 (80)
Solar gains	71.7444	135.4441	213.6511	301.0551	362.2938	368.5528 351.7881 306.1701 244.6814 157.9928 88.5093 59.6417 (83)
Total gains	607.4797	683.4792	739.7309	810.1206	846.9095	837.0109 803.4906 758.5165 709.8945 637.7221 595.6759 584.6881 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	137.5740	137.9734	138.3752	140.4198	140.8360	142.9545	142.9545	143.3858	142.0995	140.8360	140.0061	139.1859
alpha	10.1716	10.1982	10.2250	10.3613	10.3891	10.5303	10.5303	10.5591	10.4733	10.3891	10.3337	10.2791
util living area	0.9957	0.9851	0.9464	0.8009	0.6017	0.4136	0.2962	0.3271	0.5286	0.8539	0.9827	0.9969 (86)
Living	20.6963	20.7820	20.8793	20.9555	20.9691	20.9704	20.9704	20.9705	20.9700	20.9483	20.8204	20.6826
Non living	20.0567	20.1418	20.2337	20.3041	20.3146	20.3246	20.3246	20.3265	20.3207	20.3019	20.1880	20.0499
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	20.8446	20.7820	20.8793	20.9555	20.9691	20.9704	20.9704	20.9705	20.9700	20.9483	20.8204	20.7270 (87)
Th 2	20.3305	20.3323	20.3342	20.3433	20.3451	20.3542	20.3542	20.3560	20.3506	20.3451	20.3414	20.3378 (88)
util rest of house	0.9940	0.9795	0.9296	0.7643	0.5599	0.3719	0.2527	0.2813	0.4790	0.8138	0.9753	0.9957 (89)
MIT 2	20.1905	20.1418	20.2337	20.3041	20.3146	20.3246	20.3246	20.3265	20.3207	20.3019	20.1880	20.0902 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.2978	20.2469	20.3397	20.4110	20.4220	20.4305	20.4306	20.4322	20.4273	20.4079	20.2918	20.1947 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2978	20.2469	20.3397	20.4110	20.4220	20.4305	20.4306	20.4322	20.4273	20.4079	20.2918	20.1947 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9787	0.9298	0.7682	0.5648	0.3768	0.2579	0.2867	0.4849	0.8179	0.9747	0.9953 (94)
Useful gains	603.7846	668.9057	687.7786	622.3280	478.3349	315.3814	207.2036	217.4526	344.2251	521.5865	580.5805	581.9577 (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	899.2035	860.1185	773.3947	633.8987	478.8928	315.3882	207.2037	217.4529	344.3158	538.5153	728.6024	888.6162 (97)
Space heating kWh	219.7916	128.4950	63.6984	8.3309	0.4151	0.0000	0.0000	0.0000	0.0000	12.5951	106.5757	228.1539 (98a)
Space heating requirement - total per year (kWh/year)												768.0558
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	219.7916	128.4950	63.6984	8.3309	0.4151	0.0000	0.0000	0.0000	0.0000	12.5951	106.5757	228.1539 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												768.0558
Space heating per m2										(98c) / (4) =		9.7247 (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 %)												266.4630 (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	219.7916	128.4950	63.6984	8.3309	0.4151	0.0000	0.0000	0.0000	0.0000	12.5951	106.5757	228.1539 (98)
Space heating efficiency (main heating system 1)	266.4630	266.4630	266.4630	266.4630	266.4630	0.0000	0.0000	0.0000	0.0000	266.4630	266.4630	266.4630 (210)
Space heating fuel (main heating system)	82.4848	48.2225	23.9051	3.1265	0.1558	0.0000	0.0000	0.0000	0.0000	4.7268	39.9964	85.6231 (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	240.8944	213.1928	226.9582	200.7578	195.4131	176.9683	175.3328	181.8193	183.2813	203.3093	214.8684	238.4302 (64)
Efficiency of water heater	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021 (216)
(217)m	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021	286.8021 (217)
Fuel for water heating, kWh/month	83.9933	74.3345	79.1341	69.9987	68.1352	61.7040	61.1337	63.3954	63.9052	70.8884	74.9187	83.1341 (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	19.1791	17.3231	19.1791	18.5605	19.1791	18.5605	19.1791	19.1791	18.5605	19.1791	18.5605	19.1791 (221)
Lighting	24.2405	19.4466	17.5095	12.8282	9.9089	8.0956	9.0392	11.7495	15.2615	20.0239	22.6169	24.9142 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												288.2410 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												286.8021
Water heating fuel used												854.6752 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												225.8190 (230a)
Total electricity for the above, kWh/year												225.8190 (231)

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Electricity for lighting (calculated in Appendix L)	195.6345	(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	1564.3697	(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	288.2410	0.1593	45.9246	(261)
Total CO2 associated with community systems			0.0000	(273)
Water heating (other fuel)	854.6752	0.1407	120.2870	(264)
Space and water heating			166.2117	(265)
Pumps, fans and electric keep-hot	225.8190	0.1387	31.3239	(267)
Energy for lighting	195.6345	0.1443	28.2361	(268)
Total CO2, kg/year			225.7716	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	288.2410	1.5897	458.2205	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	854.6752	1.5204	1299.4461	(278)
Space and water heating			1757.6666	(279)
Pumps, fans and electric keep-hot	225.8190	1.5128	341.6190	(281)
Energy for lighting	195.6345	1.5338	300.0708	(282)
Total Primary energy kWh/year			2399.3564	(286)
Dwelling Primary energy Rate (DPER)			30.3800	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	39.4900 (1b)	x 2.4000 (2b)	= 94.7760 (1b) - (3b)	
First floor	39.4900 (1c)	x 3.0000 (2c)	= 118.4700 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.9800		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.2460	(5)

2. Ventilation rate

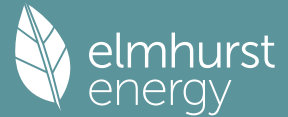
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1407 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3907	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3614 (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	0.4608	0.4517	0.4427	0.3975	0.3885	0.3433	0.3433	0.3343	0.3614	0.3885	0.4066	0.4246	(22b)
Effective ac	0.6062	0.6020	0.5980	0.5790	0.5755	0.5589	0.5589	0.5559	0.5653	0.5755	0.5826	0.5902	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling	m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K						
TER Opaque door					2.1800		1.0000		2.1800				(26)						
TER Opening Type					12.8200		1.1450		14.6794				(27)						
Heatloss Floor 1					39.4900		0.1300		5.1337				(28a)						
00 External Wall	42.3600	10.1300			32.2300		0.1800		5.8014				(29a)						
01 External Wall	42.3600	4.8700			37.4900		0.1800		6.7482				(29a)						
Roof	39.4900				39.4900		0.1100		4.3439				(30)						
Total net area of external elements Aum(A, m2)					163.7000										(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =					38.8866					(33)				
Main dwelling																			
00 Party Wall					21.6000		0.0000		0.0000				(32)						
01 Party Wall					27.0000		0.0000		0.0000				(32)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													352.4677 (35)						
List of Thermal Bridges																			
K1 Element														Length		Psi-value		Total	
E1 Steel lintel with perforated steel base plate														10.6400		0.0500		0.5320	
E3 Sill														9.6000		0.0500		0.4800	
E4 Jamb														21.8800		0.0500		1.0940	
E5 Ground floor (normal)														17.6500		0.1600		2.8240	
E6 Intermediate floor within a dwelling														17.6500		0.0000		0.0000	
E16 Corner (normal)														10.8000		0.0900		0.9720	
E18 Party wall between dwellings														10.8000		0.0600		0.6480	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																		6.5500 (36)	
Point Thermal bridges																		0.0000	
Total fabric heat loss													(33) + (36) + (36a) =					45.4366 (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							
	42.6555	42.3655	42.0811	40.7457	40.4958	39.3327	39.3327	39.1173	39.7807	40.4958	41.0013	41.5297	(38)						
Heat transfer coeff	88.0921	87.8020	87.5177	86.1823	85.9324	84.7693	84.7693	84.5539	85.2173	85.9324	86.4379	86.9663	(39)						
Average = Sum(39)m / 12 =													86.1811						
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
HLP (average)	1.1154	1.1117	1.1081	1.0912	1.0880	1.0733	1.0733	1.0706	1.0790	1.0880	1.0944	1.1011	(40)						
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31							

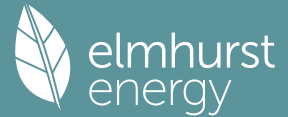
4. Water heating energy requirements (kWh/year)																			

Assumed occupancy													2.4432 (42)						
Hot water usage for mixer showers																			
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)						
Hot water usage for baths																			
	75.1611	74.0449	72.4730	69.5747	67.4044	64.9980	63.6981	65.2591	66.9586	69.5336	72.4916	74.9070	(42b)						
Hot water usage for other uses																			
	39.6510	38.2092	36.7673	35.3255	33.8836	32.4418	32.4418	33.8836	35.3255	36.7673	38.2092	39.6510	(42c)						
Average daily hot water use (litres/day)													105.7326 (43)						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Daily hot water use	114.8122	112.2541	109.2403	104.9001	101.2880	97.4397	96.1399	99.1427	102.2841	106.3009	110.7008	114.5581	(44)						
Energy conte	181.8344	159.8483	167.8983	143.6030	136.3532	119.8135	116.2729	122.7593	126.1265	144.2493	157.7136	179.3703	(45)						
Energy content (annual)													Total = Sum(45)m =		1755.8427				
Distribution loss (46)m = 0.15 x (45)m																			
	27.2752	23.9772	25.1847	21.5405	20.4530	17.9720	17.4409	18.4139	18.9190	21.6374	23.6570	26.9055	(46)						
Water storage loss (or HIU 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 (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 (59)						
Combi loss													0.0000 (61)						
Total heat required for water heating calculated for each month																			
	232.7605	205.8461	218.8244	192.8863	187.2792	169.0968	167.1990	173.6854	175.4098	195.1754	206.9969	230.2964	(62)						
WWHRS													0.0000 (63a)						
PV diverter													-0.0000 (63b)						
Solar input													0.0000 (63c)						
FGHRS													0.0000 (63d)						
Output from w/h																			
	232.7605	205.8461	218.8244	192.8863	187.2792	169.0968	167.1990	173.6854	175.4098	195.1754	206.9969	230.2964	(64)						
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m =		2355.4561 (64)				
Electric shower(s)													2355 (64)						
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)						
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)						
Heat gains from water heating, kWh/month																			
	101.2008	89.9478	96.5670	87.1746	86.0783	79.2646	79.4016	81.5583	81.3637	88.7038	91.8664	100.3815	(65)						

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

Metabolic gains (Table 5), Watts																			
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	114.0227	126.2394	114.0227	117.8235	114.0227	117.8235	114.0227	114.0227	117.8235	114.0227	117.8235	114.0227	(67)						
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5																			
	217.2955	219.5504	213.8683	201.7716	186.5018	172.1504	162.5627	160.3079	165.9900	178.0866	193.3564	207.7079	(68)						
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5																			
	35.2161	35.2161	35.2161	35.2161	35.2161	35.2161	35.2161	35.2161	35.2161	35.2161	35.2161	35.2161	(69)						
Pumps, fans																			
	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)						
Losses e.g. evaporation (negative values) (Table 5)																			
	-97.7289	-97.7289	-97.7289	-97.7289	-97.7289	-97.7289	-97.7289	-97.7289	-97.7289	-97.7289	-97.7289	-97.7289	(71)						
Water heating gains (Table 5)																			
	136.0226	133.8508	129.7944	121.0759	115.6966	110.0898	106.7226	109.6214	113.0051	119.2255	127.5922	134.9213	(72)						
Total internal gains																			
	529.9892	542.2890	520.3337	503.3193	478.8695	459.7120	442.9563	443.6003	456.4670	473.9832	501.4204	519.3003	(73)						

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6b	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W
East	4.4800				19.6403		0.6300		0.7000	0.7700	26.8904 (76)
South	1.3200				46.7521		0.6300		0.7000	0.7700	18.8602 (78)
West	7.0200				19.6403		0.6300		0.7000	0.7700	42.1363 (80)
Solar gains	87.8869	165.9190	261.7226	368.7925	443.8100	451.4772	430.9405	375.0584	299.7347	193.5412	73.0611 (83)
Total gains	617.8761	708.2080	782.0563	872.1118	922.6795	911.1891	873.8968	818.6587	756.2017	667.5244	592.3614 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)											
tau	87.7803	88.0703	88.3564	89.7255	89.9864	91.2211	91.2211	91.4535	90.7416	89.9864	88.9166
alpha	6.8520	6.8714	6.8904	6.9817	6.9991	7.0814	7.0814	7.0969	7.0494	6.9991	6.9278
util living area	0.9985	0.9957	0.9860	0.9382	0.8041	0.5892	0.4262	0.4738	0.7437	0.9636	0.9989 (86)
MIT	20.1202	20.2699	20.4867	20.7679	20.9408	20.9941	20.9995	20.9989	20.9735	20.7411	20.1028 (87)
Th 2	19.9883	19.9913	19.9942	20.0080	20.0106	20.0227	20.0227	20.0249	20.0180	20.0106	19.9999 (88)
util rest of house	0.9978	0.9937	0.9795	0.9115	0.7406	0.5025	0.3319	0.3742	0.6536	0.9419	0.9983 (89)
MIT 2	18.9765	19.1697	19.4452	19.7927	19.9697	20.0203	20.0226	20.0247	20.0047	19.7719	18.9634 (90)
Living area fraction									fLA = Living area / (4) =		0.1641 (91)
MIT	19.1642	19.3502	19.6161	19.9527	20.1291	20.1801	20.1829	20.1846	20.1637	19.9309	19.1504 (92)
Temperature adjustment											0.0000
adjusted MIT	19.1642	19.3502	19.6161	19.9527	20.1291	20.1801	20.1829	20.1846	20.1637	19.9309	19.1504 (93)

8. Space heating requirement

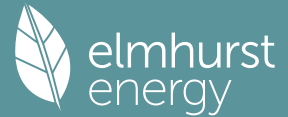
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9969	0.9919	0.9762	0.9098	0.7488	0.5167	0.3474	0.3906	0.6678	0.9396	0.9914	0.9976 (94)
Useful gains	615.9712	702.4551	763.4440	793.4205	690.8887	470.8193	303.6076	319.7510	505.0124	627.2356	604.6145	590.9679 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1309.4166	1268.7575	1147.8900	952.5502	724.3292	473.0212	303.7190	319.9993	516.7298	801.8284	1072.0844	1300.1773 (97)
Space heating kWh	515.9234	380.5552	286.0278	114.5734	24.8797	0.0000	0.0000	0.0000	0.0000	129.8970	336.5783	527.6518 (98a)
Space heating requirement - total per year (kWh/year)												2316.0865
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	515.9234	380.5552	286.0278	114.5734	24.8797	0.0000	0.0000	0.0000	0.0000	129.8970	336.5783	527.6518 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2316.0865
Space heating per m2										(98c) / (4) =		29.3250 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	515.9234	380.5552	286.0278	114.5734	24.8797	0.0000	0.0000	0.0000	0.0000	129.8970	336.5783	527.6518 (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)	558.9636	412.3024	309.8893	124.1315	26.9553	0.0000	0.0000	0.0000	0.0000	140.7335	364.6569	571.6704 (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	232.7605	205.8461	218.8244	192.8863	187.2792	169.0968	167.1990	173.6854	175.4098	195.1754	206.9969	230.2964 (64)
Efficiency of water heater	85.7919	85.4183	84.6614	82.9322	80.7599	79.8000	79.8000	79.8000	79.8000	83.1683	85.1433	79.8000 (216)
Fuel for water heating, kWh/month	271.3083	240.9860	258.4701	232.5832	231.8964	211.9008	209.5225	217.6509	219.8118	234.6753	243.1160	268.2299 (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	23.6917	19.0063	17.1131	12.5378	9.6845	7.9124	8.8346	11.4835	14.9159	19.5705	22.1049	24.3501 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-36.8411	-51.8828	-74.4978	-83.6726	-90.1501	-84.1174	-83.0751	-78.4628	-70.3117	-59.2821	-40.4817	-31.8577 (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)	-20.9800	-44.1191	-87.6635	-131.6281	-174.0121	-174.8317	-172.7762	-146.3056	-107.2584	-63.0846	-28.0081	-16.5918 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	2509.3029	1.1300	2835.5122 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2840.1512	1.1300	3209.3709 (278)
Space and water heating			6044.8831 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	191.2053	1.5338	293.2771 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-784.6331	1.4975	-1174.9830
PV Unit electricity exported	-1167.2592	0.4622	-539.4539
Total			-1714.4370 (283)
Total Primary energy kWh/year			4753.8240 (286)
Target Primary Energy Rate (TPER)			60.1900 (287)

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Plot Reference	Plot 18				Issued on Date	17/12/2025	
Assessment Reference	Plot 18			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	87 B	DER	3.05	TER	12.23		
Environmental	97 A	% DER < TER				75.06	
CO ₂ Emissions (t/year)	0.25	DFEE	38.54	TFEE	42.53		
Compliance Check	See BREL	% DFEE < TFEE				9.38	
% DPER < TPER	49.82	DPER	32.16	TPER	64.10		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	46.2400 (1b)	x 2.4000 (2b)	= 110.9760 (1b) - (3b)
First floor	46.2400 (1c)	x 3.0000 (2c)	= 138.7200 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.6960 (5)

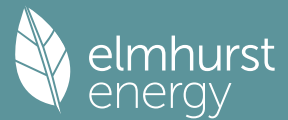
2. Ventilation rate

											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											2.0000 (17)		
Infiltration rate											0.1000 (18)		
Number of sides sheltered											0 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1000 (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)	
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	0.1275	0.1250	0.1225	0.1100	0.1075	0.0950	0.0950	0.0925	0.1000	0.1075	0.1125	0.1175 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													83.7000 (23c)
Effective ac	0.2090	0.2065	0.2040	0.1915	0.1890	0.1765	0.1765	0.1740	0.1815	0.1890	0.1940	0.1990 (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							
Glazing			12.5300	0.7752	9.7132		(27)
Front Door			2.1800	1.0000	2.1800		(26)
Heatloss Floor 1			46.2400	0.0800	3.6992	75.0000	3468.0000 (28a)
00 External Wall	68.4200	9.7900	58.6300	0.1000	5.8630	190.0000	11139.6997 (29a)
01 External Wall	68.4200	4.9200	63.5000	0.1000	6.3500	190.0000	12064.9997 (29a)
Pitched Roof N & S	46.2400		46.2400	0.0900	4.1616	9.0000	416.1600 (30)
Total net area of external elements Aum(A, m ²)			229.3200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.9670		(33)
Main dwelling							
00 Internal Wall			89.0800			9.0000	801.7200 (32c)
01 Internal Wall			111.2400			9.0000	1001.1600 (32c)
Internal Floor 1			46.2400			18.0000	832.3200 (32d)
00 Internal Ceiling			46.2400			9.0000	416.1600 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 30140.2193 (34)
 Thermal mass parameter ($\text{TMP} = C_m / \text{TFA}$) in $\text{kJ/m}^2\text{K}$ 325.9107 (35)
 Thermal bridges (User defined value $0.100 \times \text{total exposed area}$) 22.9320 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 54.8990 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2215	17.0155	16.8095	15.7795	15.5735	14.5435	14.5435	14.3375	14.9555	15.5735	15.9855	16.3975 (38)
Average = $\text{Sum}(39)\text{m} / 12 =$	72.1205	71.9145	71.7085	70.6785	70.4725	69.4425	69.4425	69.2365	69.8545	70.4725	70.8845	71.2965 (39)
												70.6270
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7798	0.7776	0.7754	0.7643	0.7620	0.7509	0.7509	0.7487	0.7553	0.7620	0.7665	0.7709 (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	2.6582 (42)											
Hot water usage for mixer showers	0.0000 (42a)											
Hot water usage for baths	79.3337 (42b)											
Hot water usage for other uses	41.8523 (42c)											
Average daily hot water use (litres/day)	111.6024 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	121.1860	118.4859	115.3048	110.7237	106.9111	102.8491	101.4772	104.6466	107.9624	112.2023	116.8464	120.9178 (44)
Energy content (annual)	191.9290	168.7223	177.2192	151.5752	143.9229	126.4650	122.7278	129.5744	133.1285	152.2574	166.4691	189.3281 (45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	28.7894 (46)											
Water storage loss (or HIU loss):	200.0000 (47)											
Store volume	1.3000 (48)											
a) If manufacturer declared loss factor is known (kWh/day):	0.5400 (49)											
Temperature factor from Table 2b	0.7020 (55)											
Enter (49) or (54) in (55)	21.7620 (56)											
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	250.9890	222.0668	236.2792	208.7300	202.9828	183.6198	181.7878	188.6343	190.2833	211.3174	223.6239	248.3880 (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	250.9890	222.0668	236.2792	208.7300	202.9828	183.6198	181.7878	188.6343	190.2833	211.3174	223.6239	248.3880 (64)
12Total per year (kWh/year)	2548.7023 (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) = $\text{Sum}(64a)\text{m} =$	0.0000 (64a)											
Heat gains from water heating, kWh/month	111.0644	98.7758	106.1734	96.1226	95.1023	87.7735	88.0550	90.3314	89.9891	97.8736	101.0748	110.1996 (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	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.7449	146.9675	132.7449	137.1697	132.7449	137.1697	132.7449	132.7449	137.1697	132.7449	137.1697	132.7449 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	243.5670	246.0945	239.7254	226.1662	209.0503	192.9637	182.2169	179.6894	186.0586	199.6177	216.7336	232.8202 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267 (71)
Water heating gains (Table 5)	149.2801	146.9877	142.7061	133.5036	127.8257	121.9076	118.3535	121.4132	124.9848	131.5505	140.3817	148.1177 (72)
Total internal gains	588.4645	602.9223	578.0488	559.7120	532.4934	514.9135	496.1877	496.7200	511.0855	526.7855	557.1575	576.5552 (73)

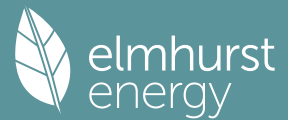
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				4.3200	19.6403		0.4500		0.8000		0.7700		21.1674 (76)
West				8.2100	19.6403		0.4500		0.8000		0.7700		40.2278 (80)
Solar gains	61.3952	120.1020	197.7908	288.4661	353.5260	361.8968	344.5405	295.9552	230.0389	142.5111	76.5525		50.4884 (83)
Total gains	649.8596	723.0242	775.8397	848.1781	886.0194	876.8103	840.7282	792.6752	741.1244	669.2966	633.7100		627.0436 (84)

7. Mean internal temperature (heating season)

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

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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	116.0874	116.4199	116.7544	118.4558	118.8021	120.5642	120.5642	120.9229	119.8531	118.8021	118.1116	117.4291
alpha	8.7392	8.7613	8.7836	8.8971	8.9201	9.0376	9.0376	9.0615	8.9902	8.9201	8.8741	8.8286
util living area	0.9979	0.9939	0.9794	0.9026	0.7259	0.5063	0.3634	0.4017	0.6455	0.9350	0.9928	0.9984 (86)
Living	20.5522	20.6387	20.7569	20.8984	20.9560	20.9652	20.9655	20.9656	20.9627	20.8854	20.7003	20.5403
Non living	19.8616	19.9490	20.0657	20.2021	20.2466	20.2615	20.2616	20.2636	20.2565	20.1957	20.0190	19.8567
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	20.7709	20.6387	20.7569	20.8984	20.9560	20.9652	20.9655	20.9656	20.9627	20.8854	20.7003	20.6046 (87)
Th 2	20.2708	20.2728	20.2747	20.2844	20.2864	20.2961	20.2961	20.2980	20.2922	20.2864	20.2825	20.2786 (88)
util rest of house	0.9971	0.9915	0.9716	0.8737	0.6756	0.4509	0.3053	0.3405	0.5817	0.9078	0.9895	0.9978 (89)
MIT 2	20.0615	19.9490	20.0657	20.2021	20.2466	20.2615	20.2616	20.2636	20.2565	20.1957	20.0190	19.9157 (90)
Living area fraction									FLA = Living area / (4) =			0.1979 (91)
MIT	20.2019	20.0855	20.2025	20.3399	20.3870	20.4007	20.4009	20.4025	20.3962	20.3322	20.1538	20.0521 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2019	20.0855	20.2025	20.3399	20.3870	20.4007	20.4009	20.4025	20.3962	20.3322	20.1538	20.0521 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9907	0.9707	0.8761	0.6828	0.4592	0.3139	0.3496	0.5912	0.9098	0.9888	0.9975 (94)
Useful gains	647.8847	716.3143	753.0887	743.1271	605.0139	402.6251	263.9390	277.1093	438.1698	608.9396	626.5984	625.5008 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	17.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1146.8516	1092.0545	982.5825	808.5560	612.1915	402.8180	263.9442	277.1224	439.8196	685.8492	925.3146	1130.1962 (97)
Space heating kWh	371.2314	252.4974	170.7434	47.1088	5.3401	0.0000	0.0000	0.0000	0.0000	57.2208	215.0756	375.4934 (98a)
Space heating requirement - total per year (kWh/year)												1494.7108
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	371.2314	252.4974	170.7434	47.1088	5.3401	0.0000	0.0000	0.0000	0.0000	57.2208	215.0756	375.4934 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1494.7108
Space heating per m2										(98c) / (4) =		16.1625 (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 %)												272.5170 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	371.2314	252.4974	170.7434	47.1088	5.3401	0.0000	0.0000	0.0000	0.0000	57.2208	215.0756	375.4934 (98)
Space heating efficiency (main heating system 1)	272.5170	272.5170	272.5170	272.5170	272.5170	0.0000	0.0000	0.0000	0.0000	272.5170	272.5170	272.5170 (210)
Space heating fuel (main heating system)	136.2232	92.6538	62.6542	17.2865	1.9596	0.0000	0.0000	0.0000	0.0000	20.9971	78.9219	137.7871 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	250.9890	222.0668	236.2792	208.7300	202.9828	183.6198	181.7878	188.6343	190.2833	211.3174	223.6239	248.3880 (64)
Efficiency of water heater	285.7669	285.7669	285.7669	285.7669	285.7669	285.7669	285.7669	285.7669	285.7669	285.7669	285.7669	285.7669 (216)
Fuel for water heating, kWh/month	87.8300	77.7091	82.6825	73.0421	71.0309	64.2551	63.6140	66.0099	66.5869	73.9475	78.2540	86.9198 (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	22.4574	20.2841	22.4574	21.7330	22.4574	21.7330	22.4574	22.4574	21.7330	22.4574	21.7330	22.4574 (231)
Lighting	28.2207	22.6397	20.3845	14.9346	11.5359	9.4249	10.5234	13.6788	17.7673	23.3117	26.3305	29.0050 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												548.4835 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.7669
Water heating fuel used												891.8817 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												264.4181 (230a)
Total electricity for the above, kWh/year												264.4181 (231)
Electricity for lighting (calculated in Appendix L)												227.7571 (232)

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

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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	1932.5404 (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	548.4835	0.1578	86.5778 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	891.8817	0.1408	125.5509 (264)
Space and water heating			212.1287 (265)
Pumps, fans and electric keep-hot	264.4181	0.1387	36.6780 (267)
Energy for lighting	227.7571	0.1443	32.8724 (268)
Total CO2, kg/year			281.6792 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	548.4835	1.5843	868.9818 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	891.8817	1.5205	1356.1174 (278)
Space and water heating			2225.0993 (279)
Pumps, fans and electric keep-hot	264.4181	1.5128	400.0117 (281)
Energy for lighting	227.7571	1.5338	349.3415 (282)
Total Primary energy kWh/year			2974.4524 (286)
Dwelling Primary energy Rate (DPER)			32.1600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	46.2400 (1b)	x 2.4000 (2b)	= 110.9760 (1b) - (3b)
First floor	46.2400 (1c)	x 3.0000 (2c)	= 138.7200 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.6960 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

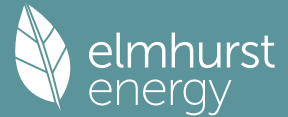
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1201 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3701 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3701 (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	0.4719	0.4627	0.4534	0.4072	0.3979	0.3516	0.3516	0.3424	0.3701	0.3979	0.4164	0.4349 (22b)
Effective ac	0.6114	0.6070	0.6028	0.5829	0.5792	0.5618	0.5618	0.5586	0.5685	0.5792	0.5867	0.5946 (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			2.1800	1.0000	2.1800		(26)
TER Opening Type			12.5300	1.1450	14.3473		(27)

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Heatloss Floor 1				46.2400	0.1300	6.0112	(28a)
00 External Wall	68.4200	9.7900		58.6300	0.1800	10.5534	(29a)
01 External Wall	68.4200	4.9200		63.5000	0.1800	11.4300	(29a)
Pitched Roof N & S	46.2400			46.2400	0.1100	5.0864	(30)
Total net area of external elements Aum(A, m2)				229.3200			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.6083		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 325.9107 (35)

List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				10.1300	0.0500	0.5065	
E3 Sill				9.0900	0.0500	0.4545	
E4 Jamb				24.9600	0.0500	1.2480	
E5 Ground floor (normal)				28.5100	0.1600	4.5616	
E6 Intermediate floor within a dwelling				28.5100	0.0000	0.0000	
E16 Corner (normal)				21.6000	0.0900	1.9440	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7146 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 58.3229 (37)

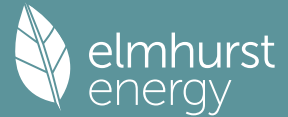
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	50.3760	50.0197	49.6704	48.0299	47.7230	46.2942	46.2942	46.0296	46.8446	47.7230	48.3439	48.9931	(38)
Average = Sum(39)m / 12 =	108.6990	108.3426	107.9934	106.3529	106.0459	104.6171	104.6171	104.3525	105.1675	106.0459	106.6669	107.3160	(39)
												106.3514	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1754	1.1715	1.1677	1.1500	1.1467	1.1312	1.1312	1.1284	1.1372	1.1467	1.1534	1.1604	(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													2.6582 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	79.3337	78.1555	76.4963	73.4371	71.1464	68.6064	67.2344	68.8819	70.6758	73.3938	76.5160	79.0655	(42c)
Average daily hot water use (litres/day)	41.8523	40.3304	38.8085	37.2866	35.7647	34.2428	34.2428	35.7647	37.2866	38.8085	40.3304	41.8523	(43)
												111.6024	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	121.1860	118.4859	115.3048	110.7237	106.9111	102.8491	101.4772	104.6466	107.9624	112.2023	116.8464	120.9178	(44)
Energy content (annual)	191.9290	168.7223	177.2192	151.5752	143.9229	126.4650	122.7278	129.5744	133.1285	152.2574	166.4691	189.3281	(45)
Distribution loss (46)m = 0.15 x (45)m													1853.3189
Water storage loss (or HIU loss):	28.7894	25.3084	26.5829	22.7363	21.5884	18.9698	18.4092	19.4362	19.9693	22.8386	24.9704	28.3992	(46)
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 (56)
If cylinder contains dedicated solar storage													27.6637 (57)
Primary 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	(59)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(61)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(62)
WWHRS	242.8551	214.7201	228.1453	200.8585	194.8489	175.7483	173.6539	180.5005	182.4118	203.1835	215.7524	240.2542	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64)
12Total per year (kWh/year)	242.8551	214.7201	228.1453	200.8585	194.8489	175.7483	173.6539	180.5005	182.4118	203.1835	215.7524	240.2542	(64)
Electric shower(s)													2452.9324 (64)
													2453 (64)
Heat gains from water heating, kWh/month													
	104.5573	92.8984	99.6662	89.8254	88.5952	81.4763	81.5479	83.8243	83.6919	91.3664	94.7776	103.6924	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	132.9083	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	132.7449	146.9675	132.7449	137.1697	132.7449	137.1697	132.7449	132.7449	137.1697	132.7449	137.1697	132.7449	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	243.5670	246.0945	239.7254	226.1662	209.0503	192.9637	182.2169	179.6894	186.0586	199.6177	216.7336	232.8202	(68)
Pumps, fans	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	36.2908	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	-106.3267	(71)
Total internal gains	140.5340	138.2416	133.9600	124.7575	119.0796	113.1615	109.6073	112.6671	116.2387	122.8044	131.6356	139.3716	(72)
	582.7183	597.1761	572.3027	553.9659	526.7472	506.1674	487.4416	487.9739	502.3394	521.0394	551.4114	570.8091	(73)

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

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East	4.3200	19.6403	0.6300	0.7000	0.7700	25.9300 (76)
West	8.2100	19.6403	0.6300	0.7000	0.7700	49.2790 (80)

Solar gains	75.2091	147.1249	242.2937	353.3710	433.0694	443.3236	422.0621	362.5451	281.7976	174.5761	93.7769	61.8483 (83)
Total gains	657.9274	744.3010	814.5965	907.3369	959.8166	949.4910	909.5037	850.5190	784.1371	695.6155	645.1882	632.6574 (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	77.0227	77.2760	77.5259	78.7217	78.9496	80.0278	80.0278	80.2308	79.6090	78.9496	78.4900	78.0152	
alpha	6.1348	6.1517	6.1684	6.2481	6.2633	6.3352	6.3352	6.3487	6.3073	6.2633	6.2327	6.2010	
util living area	0.9987	0.9970	0.9914	0.9639	0.8737	0.6805	0.5028	0.5578	0.8275	0.9787	0.9968	0.9990 (86)	
MIT	19.9214	20.0661	20.2930	20.6146	20.8620	20.9781	20.9971	20.9947	20.9281	20.6052	20.2156	19.9072 (87)	
Th 2	19.9397	19.9428	19.9459	19.9602	19.9629	19.9754	19.9754	19.9777	19.9706	19.9629	19.9575	19.9518 (88)	
util rest of house	0.9982	0.9956	0.9874	0.9467	0.8201	0.5833	0.3877	0.4376	0.7425	0.9651	0.9952	0.9986 (89)	
MIT 2	18.6930	18.8802	19.1710	19.5796	19.8560	19.9652	19.9748	19.9764	19.9283	19.5770	19.0830	18.6839 (90)	
Living area fraction	fLA = Living area / (4) =												0.1979 (91)
MIT	18.9361	19.1148	19.3930	19.7844	20.0550	20.1656	20.1771	20.1779	20.1261	19.7805	19.3071	18.9260 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.9361	19.1148	19.3930	19.7844	20.0550	20.1656	20.1771	20.1779	20.1261	19.7805	19.3071	18.9260 (93)	

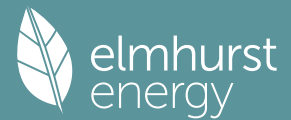
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9974	0.9941	0.9845	0.9431	0.8255	0.6022	0.4106	0.4616	0.7569	0.9619	0.9936	0.9979 (94)
Useful gains	656.2108	739.8881	801.9404	855.6804	792.3653	571.8045	373.4271	392.6216	593.5359	669.1236	641.0714	631.3564 (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	1590.9266	1540.0736	1392.3574	1157.5909	886.0175	582.2595	374.2219	394.2315	633.7525	973.5536	1302.0965	1580.3326 (97)
Space heating kWh	695.4286	537.7246	439.2702	217.3756	69.6772	0.0000	0.0000	0.0000	0.0000	226.4960	475.9381	706.0383 (98a)
Space heating requirement - total per year (kWh/year)	3367.9485											
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	695.4286	537.7246	439.2702	217.3756	69.6772	0.0000	0.0000	0.0000	0.0000	226.4960	475.9381	706.0383 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3367.9485											
Space heating per m2	(98c) / (4) = 36.4181 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	695.4286	537.7246	439.2702	217.3756	69.6772	0.0000	0.0000	0.0000	0.0000	226.4960	475.9381	706.0383 (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)	753.4437	582.5835	475.9157	235.5098	75.4900	0.0000	0.0000	0.0000	0.0000	245.3911	515.6426	764.9386 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	242.8551	214.7201	228.1453	200.8585	194.8489	175.7483	173.6539	180.5005	182.4118	203.1835	215.7524	240.2542 (64)
Efficiency of water heater (217)m	86.2813	86.0312	85.5036	84.2374	81.9888	79.8000	79.8000	79.8000	79.8000	84.3039	85.7823	79.8000 (216)
Fuel for water heating, kWh/month	281.4689	249.5840	266.8254	238.4435	237.6531	220.2360	217.6114	226.1910	228.5862	241.0130	251.5116	278.3037 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	27.5818	22.1271	19.9230	14.5965	11.2747	9.2115	10.2852	13.3691	17.3651	22.7839	25.7344	28.3483 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-42.6564	-59.8194	-85.5188	-95.5949	-102.5852	-95.5463	-94.3457	-89.3072	-80.3431	-68.1322	-46.7762	-36.9147 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-25.0481	-52.5921	-104.3607	-156.5069	-206.7301	-207.6648	-205.2381	-173.8808	-127.5790	-75.1506	-33.4205	-19.8162 (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	3648.9150 (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	2937.4277 (219)											

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	222.6006 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2285.5279 (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	4609.4154 (238)

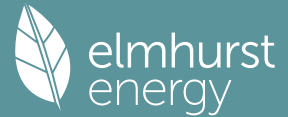
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3648.9150	0.2100	766.2721 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2937.4277	0.2100	616.8598 (264)
Space and water heating			1383.1320 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	222.6006	0.1443	32.1281 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-897.5400	0.1347	-120.9083
PV Unit electricity exported	-1387.9879	0.1259	-174.8004
Total			-295.7087 (269)
Total CO2, kg/year			1131.4807 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300 (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	3648.9150	1.1300	4123.2739 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2937.4277	1.1300	3319.2933 (278)
Space and water heating			7442.5672 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	222.6006	1.5338	341.4323 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-897.5400	1.4979	-1344.4028
PV Unit electricity exported	-1387.9879	0.4623	-641.6400
Total			-1986.0428 (283)
Total Primary energy kWh/year			5928.0575 (286)
Target Primary Energy Rate (TPER)			64.1000 (287)

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Plot Reference	Plot 19			Issued on Date	17/12/2025
Assessment Reference	Plot 19	Plot Type Ref	Plot 19		
Plot Address				SAP Version	10.2
SAP Rating	86 B	DER	3.17	TER	8.66
Environmental	97 A	% DER < TER			63.39
CO ₂ Emissions (t/year)	0.3	DFEE	42.51	TFEE	43.66
Compliance Check	See BREL	% DFEE < TFEE			2.63
% DPER < TPER	29.17	DPER	33.32	TPER	47.04
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
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	106.5300 (1b)	2.4000 (2b)	255.6720 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.5300		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	255.6720 (5)

2. Ventilation rate

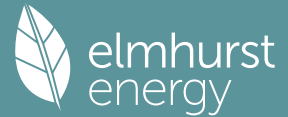
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.0000 (17)
Infiltration rate	0.1000 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1000 (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	0.1275	0.1250	0.1225	0.1100	0.1075	0.0950	0.0950	0.0925	0.1000	0.1075	0.1125	0.1175 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												83.7000 (23c)
Effective ac	0.2090	0.2065	0.2040	0.1915	0.1890	0.1765	0.1765	0.1740	0.1815	0.1890	0.1940	0.1990 (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							
Glazing			15.7500	0.7752	12.2093		(27)
Front Door			2.1400	1.0000	2.1400		(26)
Heatloss Floor 1			106.5300	0.0800	8.5224	75.0000	7989.7500 (28a)
External Wall 1		17.8900	95.1500	0.1000	9.5150	190.0000	18078.5002 (29a)
External Roof 1	113.0400		106.5300	0.0900	9.5877	9.0000	958.7700 (30)
Total net area of external elements Aum(A, m ²)			326.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.9744		(33)
Main dwelling							
Internal Wall 1			179.8600			9.0000	1618.7400 (32c)
Internal Ceiling 1			106.5300			9.0000	958.7700 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	29604.5302 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							277.8985 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							32.6100 (36)
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 74.5844 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.6337	17.4228	17.2118	16.1572	15.9463	14.8916	14.8916	14.6807	15.3135	15.9463	16.3681	16.7900 (38)
Heat transfer coeff	92.2181	92.0072	91.7962	90.7416	90.5307	89.4760	89.4760	89.2651	89.8979	90.5307	90.9525	91.3744 (39)
Average = Sum(39)m / 12 =												90.6889

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8657	0.8637	0.8617	0.8518	0.8498	0.8399	0.8399	0.8379	0.8439	0.8498	0.8538	Dec 0.8577 (40)
HLP (average)												0.8513
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7923 (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 81.9379 80.7210 79.0073 75.8477 73.4818 70.8584 69.4413 71.1430 72.9958 75.8029 79.0276 81.6608 (42b)

Hot water usage for other uses 43.2261 41.6542 40.0824 38.5105 36.9386 35.3668 35.3668 36.9386 38.5105 40.0824 41.6542 43.2261 (42c)

Average daily hot water use (litres/day) 115.2657 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	125.1639	122.3752	119.0897	114.3582	110.4204	106.2252	104.8081	108.0816	111.5063	115.8853	120.6818	124.8869 (44)
Energy conte	198.2291	174.2606	183.0364	156.5506	148.6471	130.6162	126.7563	133.8276	137.4984	157.2552	171.9334	195.5427 (45)
Energy content (annual)										Total = Sum(45)m =		1914.1538
Distribution loss (46)m = 0.15 x (45)m	29.7344	26.1391	27.4555	23.4826	22.2971	19.5924	19.0135	20.0741	20.6248	23.5883	25.7900	29.3314 (46)
Water storage loss (or HIU loss):												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7020 (55)
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980 (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	257.2890	227.6051	242.0964	213.7054	207.7071	187.7710	185.8163	192.8876	194.6532	216.3152	229.0882	254.6027 (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	257.2890	227.6051	242.0964	213.7054	207.7071	187.7710	185.8163	192.8876	194.6532	216.3152	229.0882	254.6027 (64)
Total per year (kWh/year)												2609.5372 (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	113.1591	100.6172	108.1076	97.7769	96.6731	89.1537	89.3945	91.7457	91.4421	99.5353	102.8917	112.2659 (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	139.6157	139.6157	139.6157	139.6157	139.6157	139.6157	139.6157	139.6157	139.6157	139.6157	139.6157	139.6157 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.5126	157.7818	142.5126	147.2630	142.5126	147.2630	142.5126	142.5126	147.2630	142.5126	147.2630	142.5126 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.4730	269.2382	262.2701	247.4358	228.7102	211.1108	199.3533	196.5881	203.5562	218.3905	237.1161	254.7155 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9616	36.9616	36.9616	36.9616	36.9616	36.9616	36.9616	36.9616	36.9616	36.9616	36.9616	36.9616 (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)	-111.6925	-111.6925	-111.6925	-111.6925	-111.6925	-111.6925	-111.6925	-111.6925	-111.6925	-111.6925	-111.6925	-111.6925 (71)
Water heating gains (Table 5)	152.0956	149.7280	145.3059	135.8013	129.9370	123.8246	120.1538	123.3141	127.0029	133.7840	142.9051	150.8951 (72)
Total internal gains	625.9659	641.6327	614.9733	595.3848	566.0445	547.0831	526.9044	527.2995	542.7068	559.5719	592.1690	613.0079 (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	5.3700	10.6334	0.4500	0.8000	0.7700	14.2456 (74)						
East	0.6600	19.6403	0.4500	0.8000	0.7700	3.2339 (76)						
South	6.5600	46.7521	0.4500	0.8000	0.7700	76.5139 (78)						
West	3.1600	19.6403	0.4500	0.8000	0.7700	15.4835 (80)						
Solar gains	109.4770	189.1495	266.1834	342.6588	395.8728	398.4092	381.8554	341.2694	292.4965	211.0126	131.6073	93.3832 (83)
Total gains	735.4429	830.7822	881.1567	938.0436	961.9173	945.4923	908.7598	868.5688	835.2033	770.5844	723.7763	706.3911 (84)

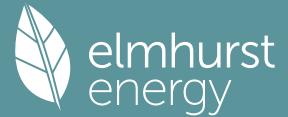
7. Mean internal temperature (heating season)

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

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tau	89.1743	89.3787	89.5841	90.6253	90.8364	91.9071	91.9071	92.1243	91.4758	90.8364	90.4151	89.9977
alpha	6.9450	6.9586	6.9723	7.0417	7.0558	7.1271	7.1271	7.1416	7.0984	7.0558	7.0277	6.9998
util living area	0.9969	0.9921	0.9802	0.9330	0.8105	0.5988	0.4326	0.4716	0.7173	0.9449	0.9914	0.9976 (86)
Living	20.3677	20.4767	20.6149	20.7933	20.9104	20.9517	20.9559	20.9557	20.9407	20.8001	20.5568	20.3501
Non living	19.6178	19.7272	19.8642	20.0394	20.1382	20.1733	20.1751	20.1768	20.1644	20.0499	19.8146	19.6063
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	20.6765	20.4767	20.6149	20.7933	20.9104	20.9517	20.9559	20.9557	20.9407	20.8001	20.5568	20.4410 (87)
Th 2	20.1968	20.1985	20.2002	20.2087	20.2104	20.2189	20.2189	20.2206	20.2155	20.2104	20.2070	20.2036 (88)
util rest of house	0.9958	0.9894	0.9734	0.9113	0.7610	0.5290	0.3562	0.3923	0.6463	0.9222	0.9880	0.9968 (89)
MIT 2	19.9006	19.7272	19.8642	20.0394	20.1382	20.1733	20.1751	20.1768	20.1644	20.0499	19.8146	19.6899 (90)
Living area fraction									fLA = Living area / (4) =			0.3050 (91)
MIT	20.1373	19.9558	20.0931	20.2693	20.3737	20.4107	20.4133	20.4144	20.4011	20.2787	20.0410	19.9189 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1373	19.9558	20.0931	20.2693	20.3737	20.4107	20.4133	20.4144	20.4011	20.2787	20.0410	19.9189 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9884	0.9723	0.9131	0.7718	0.5464	0.3752	0.4121	0.6637	0.9245	0.9871	0.9965 (94)
Useful gains	732.3165	821.1384	856.7391	856.5688	742.4446	516.5951	340.9988	357.9660	554.3548	712.3776	714.4458	703.8839 (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	1460.4828	1385.2416	1247.7979	1031.6714	785.2376	519.9182	341.1968	358.3441	566.4575	876.2186	1177.0172	1436.3085 (97)
Space heating kWh	541.7557	379.0774	290.9477	126.0739	31.8380	0.0000	0.0000	0.0000	0.0000	121.8977	333.0514	544.9239 (98a)
Space heating requirement - total per year (kWh/year)												2369.5656
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	541.7557	379.0774	290.9477	126.0739	31.8380	0.0000	0.0000	0.0000	0.0000	121.8977	333.0514	544.9239 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2369.5656
Space heating per m2										(98c) / (4) =		22.2432 (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 %)												273.7027 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	541.7557	379.0774	290.9477	126.0739	31.8380	0.0000	0.0000	0.0000	0.0000	121.8977	333.0514	544.9239 (98)
Space heating efficiency (main heating system 1)	273.7027	273.7027	273.7027	273.7027	273.7027	0.0000	0.0000	0.0000	0.0000	273.7027	273.7027	273.7027 (210)
Space heating fuel (main heating system)	197.9358	138.4997	106.3006	46.0623	11.6323	0.0000	0.0000	0.0000	0.0000	44.5365	121.6836	199.0933 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	257.2890	227.6051	242.0964	213.7054	207.7071	187.7710	185.8163	192.8876	194.6532	216.3152	229.0882	254.6027 (64)
Efficiency of water heater	284.1236	284.1236	284.1236	284.1236	284.1236	284.1236	284.1236	284.1236	284.1236	284.1236	284.1236	284.1236 (216)
Fuel for water heating, kWh/month	90.5553	80.1078	85.2081	75.2157	73.1045	66.0878	65.3998	67.8886	68.5100	76.1342	80.6298	89.6098 (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	22.9949	20.7696	22.9949	22.2531	22.9949	22.2531	22.9949	22.9949	22.2531	22.9949	22.2531	22.9949 (231)
Lighting	30.2972	24.3056	21.8845	16.0335	12.3847	10.1184	11.2978	14.6853	19.0747	25.0271	28.2680	31.1393 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												865.7443 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												284.1236
Water heating fuel used												918.4514 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												270.7464 (230a)
Total electricity for the above, kWh/year												270.7464 (231)
Electricity for lighting (calculated in Appendix L)												244.5161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)

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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	2299.4583 (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	865.7443	0.1567	135.6933 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	918.4514	0.1408	129.3076 (264)
Space and water heating			265.0009 (265)
Pumps, fans and electric keep-hot	270.7464	0.1387	37.5559 (267)
Energy for lighting	244.5161	0.1443	35.2912 (268)
Total CO2, kg/year			337.8480 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1700 (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	865.7443	1.5802	1368.0870 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	918.4514	1.5206	1396.5790 (278)
Space and water heating			2764.6660 (279)
Pumps, fans and electric keep-hot	270.7464	1.5128	409.5852 (281)
Energy for lighting	244.5161	1.5338	375.0470 (282)
Total Primary energy kWh/year			3549.2982 (286)
Dwelling Primary energy Rate (DPER)			33.3200 (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	106.5300 (1b)	x 2.4000 (2b)	= 255.6720 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 255.6720 (5)

2. Ventilation rate

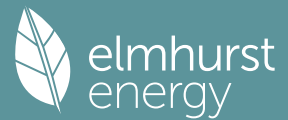
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	40.0000 / (5) = 0.1565 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4065 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4065 (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	0.5182	0.5081	0.4979	0.4471	0.4369	0.3861	0.3861	0.3760	0.4065	0.4369	0.4573	0.4776 (22b)
Effective ac	0.6343	0.6291	0.6240	0.5999	0.5955	0.5745	0.5745	0.5707	0.5826	0.5955	0.6045	0.6140 (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			2.1400	1.0000	2.1400		(26)
TER Opening Type			15.7500	1.1450	18.0344		(27)
Heatloss Floor 1			106.5300	0.1300	13.8489		(28a)
External Wall 1	113.0400	17.8900	95.1500	0.1800	17.1270		(29a)
External Roof 1	106.5300		106.5300	0.1100	11.7183		(30)

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Total net area of external elements Aum(A, m2) 326.1000 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 62.8686 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 277.8985 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	12.5600	0.0500	0.6280
E3 Sill	11.5400	0.0500	0.5770
E4 Jamb	29.7000	0.0500	1.4850
E5 Ground floor (normal)	47.1000	0.1600	7.5360
E16 Corner (normal)	12.0000	0.0900	1.0800
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.0900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 73.9586 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 53.5152 Feb 53.0752 Mar 52.6440 Apr 50.6186 May 50.2397 Jun 48.4756 Jul 48.4756 Aug 48.1489 Sep 49.1551 Oct 50.2397 Nov 51.0063 Dec 51.8077 (38)
Heat transfer coeff 127.4737 127.0338 126.6026 124.5772 124.1982 122.4341 122.4341 122.1074 123.1136 124.1982 124.9648 125.7663 (39)
Average = Sum(39)m / 12 = 124.5753

HLP Jan 1.1966 Feb 1.1925 Mar 1.1884 Apr 1.1694 May 1.1659 Jun 1.1493 Jul 1.1493 Aug 1.1462 Sep 1.1557 Oct 1.1659 Nov 1.1730 Dec 1.1806 (40)
HLP (average) 1.1694
Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7923 (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 81.9379 80.7210 79.0073 75.8477 73.4818 70.8584 69.4413 71.1430 72.9958 75.8029 79.0276 81.6608 (42b)
Hot water usage for other uses 43.2261 41.6542 40.0824 38.5105 36.9386 35.3668 35.3668 36.9386 38.5105 40.0824 41.6542 43.2261 (42c)
Average daily hot water use (litres/day) 115.2657 (43)

Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
125.1639 122.3752 119.0897 114.3582 110.4204 106.2252 104.8081 108.0816 111.5063 115.8853 120.6818 124.8869 (44)
Energy conte 198.2291 174.2606 183.0364 156.5506 148.6471 130.6162 126.7563 133.8276 137.4984 157.2552 171.9334 195.5427 (45)
Energy content (annual) Total = Sum(45)m = 1914.1538
Distribution loss (46)m = 0.15 x (45)m 29.7344 26.1391 27.4555 23.4826 22.2971 19.5924 19.0135 20.0741 20.6248 23.5883 25.7900 29.3314 (46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b 1.6525 (48)
Enter (49) or (54) in (55) 0.5400 (49)
0.8924 (55)

Total storage loss 27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (56)
If cylinder contains dedicated solar storage 27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month 249.1551 220.2584 233.9625 205.8339 199.5732 179.8995 177.6824 184.7537 186.7817 208.1813 221.2167 246.4688 (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 249.1551 220.2584 233.9625 205.8339 199.5732 179.8995 177.6824 184.7537 186.7817 208.1813 221.2167 246.4688 (64)
Total per year (kWh/year) = Sum(64)m = 2513.7673 (64)
2514 (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 106.6520 94.7399 101.6005 91.4797 90.1660 82.8565 82.8873 85.2385 85.1449 93.0282 96.5945 105.7588 (65)

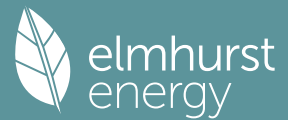
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m 139.6157 139.6157 139.6157 139.6157 139.6157 139.6157 139.6157 139.6157 139.6157 139.6157 139.6157 139.6157 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 142.5126 157.7818 142.5126 147.2630 142.5126 147.2630 142.5126 142.5126 147.2630 142.5126 147.2630 142.5126 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 266.4730 269.2382 262.2701 247.4358 228.7102 211.1108 199.3533 196.5881 203.5562 218.3905 237.1161 254.7155 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 36.9616 36.9616 36.9616 36.9616 36.9616 36.9616 36.9616 36.9616 36.9616 36.9616 36.9616 36.9616 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5) -111.6925 -111.6925 -111.6925 -111.6925 -111.6925 -111.6925 -111.6925 -111.6925 -111.6925 -111.6925 -111.6925 -111.6925 (71)
Water heating gains (Table 5) 143.3495 140.9819 136.5598 127.0552 121.1909 115.0785 111.4077 114.5679 118.2567 125.0379 134.1590 142.1490 (72)
Total internal gains 620.2198 635.8866 609.2271 589.6387 560.2984 538.3370 518.1583 518.5534 533.9607 553.8257 586.4229 607.2618 (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	5.3700	10.6334	0.6300	0.7000	0.7700	17.4509 (74)
East	0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (76)
South	6.5600	46.7521	0.6300	0.7000	0.7700	93.7295 (78)

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West	3.1600				19.6403		0.6300		0.7000		0.7700		18.9673 (80)	
Solar gains	134.1093	231.7081	326.0747	419.7570	484.9442	488.0512	467.7728	418.0550	358.3082	258.4904	161.2190	114.3945	(83)	
Total gains	754.3291	867.5947	935.3018	1009.3957	1045.2426	1026.3883	985.9311	936.6083	892.2689	812.3161	747.6418	721.6562	(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	64.5112	64.7346	64.9551	66.0111	66.2126	67.1666	67.1666	67.3463	66.7959	66.2126	65.8064	65.3870		
alpha	5.3007	5.3156	5.3303	5.4007	5.4142	5.4778	5.4778	5.4898	5.4531	5.4142	5.3871	5.3591		
util living area														
	0.9974	0.9939	0.9863	0.9590	0.8830	0.7136	0.5372	0.5847	0.8235	0.9683	0.9939	0.9979	(86)	
MIT	19.7370	19.9139	20.1610	20.5028	20.7859	20.9527	20.9916	20.9870	20.8941	20.5341	20.0845	19.7187	(87)	
Th 2	19.9227	19.9260	19.9293	19.9446	19.9474	19.9608	19.9608	19.9633	19.9556	19.9474	19.9416	19.9356	(88)	
util rest of house														
	0.9964	0.9917	0.9810	0.9420	0.8354	0.6184	0.4153	0.4608	0.7431	0.9517	0.9912	0.9971	(89)	
MIT 2	18.4629	18.6908	19.0065	19.4419	19.7686	19.9351	19.9584	19.9591	19.8870	19.4884	18.9208	18.4488	(90)	
Living area fraction														
	0.9964	0.9917	0.9810	0.9420	0.8354	0.6184	0.4153	0.4608	0.7431	0.9517	0.9912	0.9971	(89)	
MIT	18.8515	19.0638	19.3586	19.7654	20.0789	20.2455	20.2735	20.2726	20.1941	19.8073	19.2757	18.8361	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.8515	19.0638	19.3586	19.7654	20.0789	20.2455	20.2735	20.2726	20.1941	19.8073	19.2757	18.8361	(93)	

8. Space heating requirement														

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9949	0.9892	0.9771	0.9385	0.8422	0.6461	0.4528	0.4989	0.7636	0.9488	0.9888	0.9960	(94)	
Useful gains	750.5184	858.1988	913.9176	947.2731	880.3326	663.1491	446.4208	467.3113	681.3517	770.7437	739.2786	718.7457	(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														
	1854.9348	1799.2851	1627.9321	1353.5863	1040.6433	691.1966	449.7624	472.8729	750.2712	1143.5345	1521.5308	1840.7319	(97)	
Space heating kWh														
	821.6858	632.4101	531.2267	292.5455	119.2712	0.0000	0.0000	0.0000	0.0000	277.3564	563.2215	834.7578	(98a)	
Space heating requirement - total per year (kWh/year)												4072.4750		
Solar heating kWh														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)	
Solar heating contribution - total per year (kWh/year)												0.0000		
Space heating kWh														
	821.6858	632.4101	531.2267	292.5455	119.2712	0.0000	0.0000	0.0000	0.0000	277.3564	563.2215	834.7578	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												4072.4750		
Space heating per m2										(98c) / (4) =		38.2284	(99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)	
Fraction of space heat from main system(s)													1.0000 (202)	
Efficiency of main space heating system 1 (in %)													92.3000 (206)	
Efficiency of main space heating system 2 (in %)													0.0000 (207)	
Efficiency of secondary/supplementary heating system, %													0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement														
	821.6858	632.4101	531.2267	292.5455	119.2712	0.0000	0.0000	0.0000	0.0000	277.3564	563.2215	834.7578	(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)														
	890.2338	685.1680	575.5436	316.9507	129.2212	0.0000	0.0000	0.0000	0.0000	300.4944	610.2075	904.3963	(211)	
Space heating efficiency (main heating system 2)														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement														
	249.1551	220.2584	233.9625	205.8339	199.5732	179.8995	177.6824	184.7537	186.7817	208.1813	221.2167	246.4688	(64)	
Efficiency of water heater														
(217)m	86.5294	86.2862	85.8399	84.8478	82.9447	79.8000	79.8000	79.8000	79.8000	84.7040	86.0628	86.5743	(216)	
Fuel for water heating, kWh/month														
	287.9429	255.2649	272.5568	242.5919	240.6100	225.4380	222.6597	231.5209	234.0623	245.7751	257.0412	284.6906	(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														
(235a)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting														
(235c)m	29.6113	23.7553	21.3890	15.6705	12.1043	9.8894	11.0420	14.3528	18.6429	24.4604	27.6280	30.4343	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-79.1422	-102.5493	-135.5842	-139.8016	-140.8524	-128.0242	-126.3297	-123.8261	-118.4156	-110.7191	-83.6801	-69.5260	(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	-76.8387	-156.4300	-301.8696	-441.0031	-571.7635	-570.5283	-563.8662	-482.5193	-360.6056	-219.3829	-101.0808	-61.1735	(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													4412.2156 (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													3000.1543 (219)	
Space cooling fuel													0.0000 (221)	

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Electricity for pumps and fans:	86.0000 (231)
Total electricity for the above, kWh/year	238.9802 (232)
Electricity for lighting (calculated in Appendix L)	

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-5265.5121 (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	2471.8380 (238)

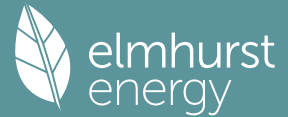
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4412.2156	0.2100	926.5653 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3000.1543	0.2100	630.0324 (264)
Space and water heating			1556.5977 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	238.9802	0.1443	34.4922 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1358.4506	0.1365	-185.3636
PV Unit electricity exported	-3907.0615	0.1267	-495.1415
Total			-680.5051 (269)
Total CO2, kg/year			922.5141 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.6600 (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	4412.2156	1.1300	4985.8036 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3000.1543	1.1300	3390.1744 (278)
Space and water heating			8375.9780 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	238.9802	1.5338	366.5558 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1358.4506	1.5044	-2043.6601
PV Unit electricity exported	-3907.0615	0.4652	-1817.6514
Total			-3861.3115 (283)
Total Primary energy kWh/year			5011.3232 (286)
Target Primary Energy Rate (TPER)			47.0400 (287)

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Plot Reference	Plot 24			Issued on Date	17/12/2025
Assessment Reference	Plot 24	Plot Type Ref	Plot 24		
Plot Address				SAP Version	10.2
SAP Rating	87 B	DER	3.30	TER	9.31
Environmental	97 A	% DER < TER			64.55
CO ₂ Emissions (t/year)	0.21	DFEE	37.15	TFEE	37.59
Compliance Check	See BREL	% DFEE < TFEE			1.18
% DPER < TPER	29.83	DPER	34.94	TPER	49.79
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
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			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000		
Dwelling volume			

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.0000	(17)
Infiltration rate	0.1000	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0925 (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	0.1179	0.1156	0.1133	0.1018	0.0994	0.0879	0.0879	0.0856	0.0925	0.0994	0.1041	0.1087 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												83.7000 (23c)
Effective ac	0.1994	0.1971	0.1948	0.1832	0.1809	0.1694	0.1694	0.1671	0.1740	0.1809	0.1856	0.1902 (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							
Glazing			11.6800	0.7752	9.0543		(27)
Front Door			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			70.0000	0.0800	5.6000	75.0000	5250.0000 (28a)
External Wall 1	59.1800	13.7800	45.4000	0.1000	4.5400	190.0000	8626.0001 (29a)
External Roof 1	70.0000		70.0000	0.0900	6.3000	9.0000	630.0000 (30)
Total net area of external elements Aum(A, m ²)			199.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.5943		(33)
Main dwelling							
Party Wall 1			21.8800	0.0000	0.0000	180.0000	3938.3998 (32)
Internal Wall 1			142.9400			9.0000	1286.4600 (32c)
Internal Ceiling 1			70.0000			9.0000	630.0000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		20360.8599 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							290.8694 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							19.9180 (36)

elmhurst
energy

$$\begin{aligned} (33) + (36) + (36a) &= 47.5123 \quad (37) \\ (36a) &= 0.0000 \end{aligned}$$
[illegible]

4. Water heating energy requirements (kWh/year)

[illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.9675	106.5397	103.6793	99.5601	96.1319	92.4795	91.2458	94.0957	97.0772	100.8896	105.0654	108.7264 (44)
Energy conte	172.5780	151.7111	159.3512	136.2928	129.4120	113.7143	110.3539	116.5102	119.7059	136.9062	149.6850	170.2392 (45)
Energy content (annual)										Total =	Sum(45)m =	1666.4597

Distribution loss	(46)m = 0.15 x (45)m											
	25.8867	22.7567	23.9027	20.4439	19.4118	17.0571	16.5531	17.4765	17.9559	20.5359	22.4527	25.5359 (46)

	(47)
Water storage loss (or HIU loss):	
Store volume	200.0000
a) If manufacturer declared loss factor is known (kWh/day):	1.3000
Temperature factor from Table 2b	0.5400
Enter (49) or (54) in (55)	0.7020
	(55)

Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
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	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (57)

[illegible]

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	231.6370	205.0555	218.4112	102.4476	198.4710	170.8601	160.4130	175.5701	176.8607	105.0661	206.8308	220.2002	(62)		

[illegible][illegible][illegible]

231.6379	205.0555	218.4112	193.4476	188.4719	170.8691	169.4139	175.5701	176.8607	195.9661	206.8398	229.2992 (64)
Total per year (kWh/year) = Sum(64)m =											2361.8431 (64)

12Total per year (kWh/year)	2362 (64)
Electric shower(s)	2362 (64)

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

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)												
Heat gains from water heating, kWh/month	104.6301	93.1195	100.2323	91.0412	90.2774	93.5328	93.9406	95.9876	95.5261	92.7693	95.4941	103.9525 (65)

Metabolic gains (Table 5), Watts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062

Lighting gains (calculated in Appendix L, equation L8 or L9a; also see Table 5)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918 (68)
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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

[illegible]

Water heating gains (Table 5)

Total internal gains	140.6319	138.5707	134.7208	126.4461	121.3407	116.0192	112.8234	115.5747	118.7862	124.6899	132.6307	139.5867 (72)
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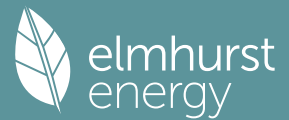
Total internal gains	497.6081	508.6286	488.5851	472.7600	450.3572	435.4381	420.1041	420.8081	432.6116	446.0657	471.3039	487.8577 (73)
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[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	5.7200	10.6334	0.4500	0.8000	0.7700	15.1741 (74)
East	0.6500	19.6403	0.4500	0.8000	0.7700	3.1849 (76)
South	4.6600	46.7521	0.4500	0.8000	0.7700	54.3529 (78)
West	0.6500	19.6403	0.4500	0.8000	0.7700	3.1849 (80)

Solar gains	75.8968	130.4752	183.1872	237.2338	276.8464	280.2086	267.8840	237.1996	201.5618	145.3167	91.0883	64.8540 (83)
Total gains	573.5049	639.1038	671.7223	709.9939	727.2036	715.6467	687.9881	658.0077	634.1735	591.3825	562.3922	552.7117 (84)

Temperature during heating periods in the living area from Table 9, T_{h1} (C)	21.0000 (85)
Utilisation factor for gains for living area, $u_{l,m}$ (see Table 9a)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	96.5662	96.7781	96.9908	98.0689	98.2874	99.3946	99.3946	99.6191	98.9488	98.2874	97.8514	97.4192
alpha	7.4377	7.4519	7.4661	7.5379	7.5525	7.6263	7.6263	7.6413	7.5966	7.5525	7.5234	7.4946
util living area	0.9921	0.9813	0.9570	0.8751	0.7152	0.5074	0.3638	0.3967	0.6154	0.8883	0.9785	0.9938 (86)
Living	20.5199	20.6221	20.7411	20.8766	20.9427	20.9581	20.9591	20.9591	20.9546	20.8802	20.6870	20.5015
Non living	19.7888	19.8899	20.0048	20.1325	20.1839	20.2010	20.2014	20.2030	20.1962	20.1392	19.9610	19.7763
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	20.7544	20.6221	20.7411	20.8766	20.9427	20.9581	20.9591	20.9591	20.9546	20.8802	20.6870	20.5712 (87)
Th 2	20.2216	20.2232	20.2248	20.2327	20.2343	20.2422	20.2422	20.2438	20.2390	20.2343	20.2311	20.2279 (88)
util rest of house	0.9895	0.9754	0.9438	0.8432	0.6636	0.4481	0.3012	0.3316	0.5505	0.8526	0.9706	0.9917 (89)
MIT 2	20.0002	19.8899	20.0048	20.1325	20.1839	20.2010	20.2014	20.2030	20.1962	20.1392	19.9610	19.8395 (90)
Living area fraction									fLA = Living area /	(4) =		0.3547 (91)
MIT	20.2677	20.1496	20.2660	20.3964	20.4531	20.4695	20.4701	20.4712	20.4652	20.4021	20.2185	20.0990 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2677	20.1496	20.2660	20.3964	20.4531	20.4695	20.4701	20.4712	20.4652	20.4021	20.2185	20.0990 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9897	0.9747	0.9446	0.8505	0.6787	0.4660	0.3201	0.3512	0.5701	0.8611	0.9704	0.9913 (94)
Useful gains	567.5693	622.9585	634.5346	603.8554	493.5792	333.4559	220.1954	231.0892	361.5303	509.2571	545.7483	547.9004 (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	935.2148	891.1994	802.7321	663.0175	503.6808	333.9896	220.2207	231.1398	363.8271	564.0442	758.2481	923.0390 (97)
Space heating kWh	273.5283	180.2578	125.1389	42.5967	7.5156	0.0000	0.0000	0.0000	0.0000	40.7616	152.9998	279.1031 (98a)
Space heating requirement - total per year (kWh/year)												1101.9018
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	273.5283	180.2578	125.1389	42.5967	7.5156	0.0000	0.0000	0.0000	0.0000	40.7616	152.9998	279.1031 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1101.9018
Space heating per m2										(98c) / (4) =		15.7415 (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 %)												268.0461 (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	273.5283	180.2578	125.1389	42.5967	7.5156	0.0000	0.0000	0.0000	0.0000	40.7616	152.9998	279.1031 (98)
Space heating efficiency (main heating system 1)	268.0461	268.0461	268.0461	268.0461	268.0461	0.0000	0.0000	0.0000	0.0000	268.0461	268.0461	268.0461 (210)
Space heating fuel (main heating system)	102.0452	67.2488	46.6856	15.8916	2.8038	0.0000	0.0000	0.0000	0.0000	15.2069	57.0797	104.1250 (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	231.6379	205.0555	218.4112	193.4476	188.4719	170.8691	169.4139	175.5701	176.8607	195.9661	206.8398	229.2992 (64)
Efficiency of water heater (217)m	286.2869	286.2869	286.2869	286.2869	286.2869	286.2869	286.2869	286.2869	286.2869	286.2869	286.2869	286.2869 (216)
Fuel for water heating, kWh/month	80.9111	71.6259	76.2910	67.5712	65.8332	59.6846	59.1763	61.3266	61.7774	68.4510	72.2491	80.0942 (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	15.1098	13.6475	15.1098	14.6224	15.1098	14.6224	15.1098	15.1098	14.6224	15.1098	14.6224	15.1098 (231)
Lighting	21.8944	17.5645	15.8149	11.5867	8.9499	7.3121	8.1644	10.6124	13.7844	18.0859	20.4280	22.5029 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												411.0867 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												286.2869
Water heating fuel used												824.9917 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8680)												
mechanical ventilation fans (SFP = 0.8680)												177.9053 (230a)
Total electricity for the above, kWh/year												177.9053 (231)
Electricity for lighting (calculated in Appendix L)												176.7005 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1590.6842 (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	411.0867	0.1577	64.8382 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	824.9917	0.1407	116.0843 (264)
Space and water heating			180.9225 (265)
Pumps, fans and electric keep-hot	177.9053	0.1387	24.6777 (267)
Energy for lighting	176.7005	0.1443	25.5033 (268)
Total CO2, kg/year			231.1035 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3000 (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	411.0867	1.5839	651.1082 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	824.9917	1.5203	1254.2215 (278)
Space and water heating			1905.3297 (279)
Pumps, fans and electric keep-hot	177.9053	1.5128	269.1351 (281)
Energy for lighting	176.7005	1.5338	271.0292 (282)
Total Primary energy kWh/year			2445.4940 (286)
Dwelling Primary energy Rate (DPER)			34.9400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	70.0000 (1b)	x 2.4000 (2b)	= 168.0000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 168.0000 (5)
Dwelling volume			

2. Ventilation rate

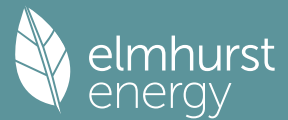
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) = 0.1190 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3690 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3414 (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	0.4352	0.4267	0.4182	0.3755	0.3670	0.3243	0.3243	0.3158	0.3414	0.3670	0.3840	0.4011 (22b)
Effective ac	0.5947	0.5910	0.5874	0.5705	0.5673	0.5526	0.5526	0.5499	0.5583	0.5673	0.5737	0.5804 (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			11.6800	1.1450	13.3740		(27)
Heatloss Floor 1			70.0000	0.1300	9.1000		(28a)
External Wall 1	59.1800	13.7800	45.4000	0.1800	8.1720		(29a)

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External Roof 1	70.0000	70.0000	0.1100	7.7000									(30)
Total net area of external elements Aum(A, m2)		199.1800											(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		40.4460									(33)
Main dwelling													
Party Wall 1		21.8800	0.0000	0.0000									(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												290.8694	(35)
List of Thermal Bridges													
K1 Element								Length	Psi-value			Total	
E1 Steel lintel with perforated steel base plate								9.4800	0.0500			0.4740	
E3 Sill								8.4300	0.0500			0.4215	
E4 Jamb								19.6700	0.0500			0.9835	
E5 Ground floor (normal)								24.6600	0.1600			3.9456	
E16 Corner (normal)								4.8000	0.0900			0.4320	
E18 Party wall between dwellings								4.8000	0.0600			0.2880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												6.5446	(36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	46.9906 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	32.9712	32.7673	32.5675	31.6287	31.4530	30.6353	30.6353	30.4839	30.9503	31.4530	31.8083	32.1798	(38)
Heat transfer coeff	79.9619	79.7580	79.5581	78.6193	78.4437	77.6260	77.6260	77.4746	77.9409	78.4437	78.7990	79.1705	(39)
Average = Sum(39)m / 12 =												78.6185	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1423	1.1394	1.1365	1.1231	1.1206	1.1089	1.1089	1.1068	1.1134	1.1206	1.1257	1.1310	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

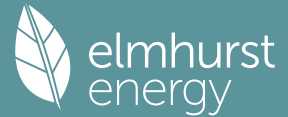
4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.2461 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	108.9675	106.5397	103.6793	99.5601	96.1319	92.4795	91.2458	94.0957	97.0772	100.8896	105.0654	108.7264	(44)
Energy content (annual)	172.5780	151.7111	159.3512	136.2928	129.4120	113.7143	110.3539	116.5102	119.7059	136.9062	149.6850	170.2392	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss (or HIU loss):	25.8867	22.7567	23.9027	20.4439	19.4118	17.0571	16.5531	17.4765	17.9559	20.5359	22.4527	25.5359	(46)
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													
Primary 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	(57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
WWHRS	223.5040	197.7088	210.2773	185.5761	180.3380	162.9976	161.2800	167.4362	168.9892	187.8323	198.9683	221.1653	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
12Total per year (kWh/year)	223.5040	197.7088	210.2773	185.5761	180.3380	162.9976	161.2800	167.4362	168.9892	187.8323	198.9683	221.1653	(64)
Electric shower(s)													2266.0731 (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)
Heat gains from water heating, kWh/month													0.0000 (64a)
	98.1230	87.2421	93.7251	84.7440	83.7703	77.2366	77.4335	79.4805	79.2289	86.2622	89.1969	97.3454	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	112.3062	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	102.9873	114.0216	102.9873	106.4202	102.9873	106.4202	102.9873	102.9873	106.4202	102.9873	106.4202	102.9873	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	197.2971	199.3444	194.1852	183.2019	169.3374	156.3068	147.6015	145.5542	150.7134	161.6967	175.5612	188.5918	(69)
Pumps, fans	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	34.2306	(70)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(71)
Water heating gains (Table 5)	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	-89.8450	(72)
Total internal gains	131.8858	129.8246	125.9747	117.7000	112.5945	107.2731	104.0773	106.8286	110.0401	115.9438	123.8846	130.8406	(73)
	491.8620	502.8825	482.8390	467.0139	444.6111	426.6920	411.3580	412.0620	423.8655	440.3196	465.5578	482.1116	(74)

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
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North				5.7200	10.6334		0.6300	0.7000		0.7700		18.5883 (74)
East				0.6500	19.6403		0.6300	0.7000		0.7700		3.9015 (76)
South				4.6600	46.7521		0.6300	0.7000		0.7700		66.5823 (78)
West				0.6500	19.6403		0.6300	0.7000		0.7700		3.9015 (80)

Solar gains	92.9736	159.8321	224.4043	290.6115	339.1368	343.2556	328.1579	290.5696	246.9132	178.0130	111.5832	79.4461 (83)
Total gains	584.8356	662.7146	707.2433	757.6254	783.7479	769.9476	739.5158	702.6315	670.7788	618.3326	577.1410	561.5577 (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	70.7311	70.9120	71.0901	71.9390	72.1001	72.8596	72.8596	73.0020	72.5651	72.1001	71.7750	71.4382
alpha	5.7154	5.7275	5.7393	5.7959	5.8067	5.8573	5.8573	5.8668	5.8377	5.8067	5.7850	5.7625
util living area	0.9950	0.9889	0.9758	0.9309	0.8208	0.6267	0.4592	0.5025	0.7456	0.9429	0.9882	0.9960 (86)
MIT	19.9769	20.1459	20.3701	20.6649	20.8825	20.9806	20.9973	20.9955	20.9486	20.6828	20.2853	19.9515 (87)
Th 2	19.9664	19.9688	19.9711	19.9820	19.9840	19.9935	19.9935	19.9953	19.9899	19.9840	19.9799	19.9756 (88)
util rest of house	0.9931	0.9849	0.9667	0.9054	0.7629	0.5367	0.3557	0.3954	0.6589	0.9163	0.9832	0.9945 (89)
MIT 2	18.7957	19.0115	19.2943	19.6581	19.8933	19.9840	19.9928	19.9940	19.9599	19.6876	19.1981	18.7703 (90)
Living area fraction										FLA = Living area / (4) =		0.3547 (91)
MIT	19.2147	19.4139	19.6759	20.0152	20.2442	20.3375	20.3491	20.3492	20.3106	20.0406	19.5838	19.1893 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2147	19.4139	19.6759	20.0152	20.2442	20.3375	20.3491	20.3492	20.3106	20.0406	19.5838	19.1893 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9912	0.9821	0.9634	0.9063	0.7790	0.5683	0.3925	0.4336	0.6881	0.9181	0.9806	0.9929 (94)
Useful gains	579.7164	650.8239	681.3736	686.6634	610.5159	437.5887	290.2789	304.6460	461.5814	567.6926	565.9299	557.5651 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1192.6091	1157.6001	1048.2514	873.8699	670.2371	445.3761	291.0291	305.9660	484.0618	740.5585	983.7070	1186.7102 (97)
Space heating kWh	455.9922	340.5536	272.9571	134.7886	44.4326	0.0000	0.0000	0.0000	0.0000	128.6122	300.7995	468.0840 (98a)
Space heating requirement - total per year (kWh/year)												2146.2199
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	455.9922	340.5536	272.9571	134.7886	44.4326	0.0000	0.0000	0.0000	0.0000	128.6122	300.7995	468.0840 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2146.2199
Space heating per m2										(98c) / (4) =		30.6603 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	455.9922	340.5536	272.9571	134.7886	44.4326	0.0000	0.0000	0.0000	0.0000	128.6122	300.7995	468.0840 (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)	494.0327	368.9639	295.7282	146.0332	48.1393	0.0000	0.0000	0.0000	0.0000	139.3415	325.8933	507.1332 (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	223.5040	197.7088	210.2773	185.5761	180.3380	162.9976	161.2800	167.4362	168.9892	187.8323	198.9683	221.1653 (64)
Efficiency of water heater (217)m	85.6236	85.2677	84.6459	83.3544	81.4315	79.8000	79.8000	79.8000	79.8000	83.2284	84.9841	79.8000 (216)
Fuel for water heating, kWh/month	261.0308	231.8683	248.4201	222.6350	221.4598	204.2576	202.1052	209.8198	211.7659	225.6830	234.1240	258.0734 (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	21.3987	17.1669	15.4568	11.3243	8.7473	7.1466	7.9795	10.3721	13.4723	17.6764	19.9655	21.9935 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-54.4591	-71.7729	-96.5458	-101.4085	-103.7483	-94.9560	-93.7924	-91.1902	-85.9250	-78.5280	-58.0722	-47.6971 (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	-48.0347	-78.4002	-190.9016	-280.2336	-364.5058	-364.0573	-359.7297	-307.2344	-228.8360	-138.3794	-63.3328	-38.1845 (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												2325.2653 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000

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Water heating fuel used	2731.2430 (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)	172.7000 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3459.9254 (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	1855.2829 (238)

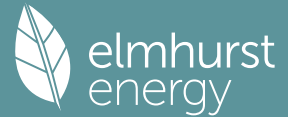
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2325.2653	0.2100	488.3057 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2731.2430	0.2100	573.5610 (264)
Space and water heating			1061.8667 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	172.7000	0.1443	24.9259 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-978.0954	0.1360	-133.0533
PV Unit electricity exported	-2481.8300	0.1266	-314.1675
Total			-447.2209 (269)
Total CO2, kg/year			651.5011 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3100 (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	2325.2653	1.1300	2627.5498 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2731.2430	1.1300	3086.3046 (278)
Space and water heating			5713.8544 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	172.7000	1.5338	264.8930 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-978.0954	1.5028	-1469.9148
PV Unit electricity exported	-2481.8300	0.4647	-1153.2873
Total			-2623.2022 (283)
Total Primary energy kWh/year			3485.6460 (286)
Target Primary Energy Rate (TPER)			49.7900 (287)

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Plot Reference	Plot 26			Issued on Date	17/12/2025
Assessment Reference	Plot 26	Plot Type Ref	Plot 26		
Plot Address				SAP Version	10.2
SAP Rating	86 B	DER	2.92	TER	10.32
Environmental	97 A	% DER < TER			71.71
CO ₂ Emissions (t/year)	0.4	DFEE	42.93	TFEE	44.99
Compliance Check	See BREL	% DFEE < TFEE			4.58
% DPER < TPER	43.78	DPER	30.48	TPER	54.22
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
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	79.9800 (1b)	x 2.4000 (2b)	= 191.9520 (1b) - (3b)
First floor	78.1100 (1c)	x 3.0000 (2c)	= 234.3300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 426.2820 (5)

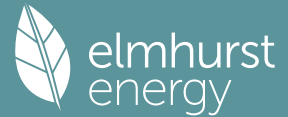
2. Ventilation rate

											m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)
Number of open flues											0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)
Number of blocked chimneys											0 * 20 =	0.0000 (6f)
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											2.0000 (17)	
Infiltration rate											0.1000 (18)	
Number of sides sheltered											0 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1000 (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)
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												
	0.1275	0.1250	0.1225	0.1100	0.1075	0.0950	0.0950	0.0925	0.1000	0.1075	0.1125	0.1175 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2090	0.2065	0.2040	0.1915	0.1890	0.1765	0.1765	0.1740	0.1815	0.1890	0.1940	0.1990 (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							
Glazing			31.4700	0.7752	24.3953		(27)
Front Door			2.1800	1.0000	2.1800		(26)
Heatloss Floor 1			79.9800	0.0800	6.3984	75.0000	5998.5000 (28a)
00 External Wall	82.3900	23.5400	58.8500	0.1000	5.8850	190.0000	11181.4999 (29a)
00 External Wall Garage	14.1100		14.1100	0.1000	1.4110	190.0000	2680.8999 (29a)
01 External Wall	119.1000	10.1100	108.9900	0.1000	10.8990	190.0000	20708.0997 (29a)
External Roof 1	111.7700		111.7700	0.0900	10.0593	9.0000	1005.9300 (30)
Total net area of external elements Aum(A, m ²)			407.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		61.2280		(33)
Main dwelling							
00 Internal Wall			103.6800			9.0000	933.1200 (32c)
01 Internal Wall			180.3000			9.0000	1622.7000 (32c)
Internal Floor 1			78.1100			18.0000	1405.9800 (32d)
00 Internal Ceiling			79.9800			9.0000	719.8200 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
Thermal bridges (User defined value $0.100 \times \text{total exposed area}$)
Point Thermal bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 46256.5496 (34)
292.5963 (35)
40.7350 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 101.9630 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	29.4007	29.0490	28.6973	26.9389	26.5872	24.8288	24.8288	24.4771	25.5322	26.5872	27.2906	27.9939 (38)
Heat transfer coeff	131.3637	131.0120	130.6604	128.9019	128.5503	126.7918	126.7918	126.4402	127.4952	128.5503	129.2536	129.9570 (39)
Average = $\text{Sum}(39)\text{m} / 12 =$												128.8140
HLP	0.8309	0.8287	0.8265	0.8154	0.8131	0.8020	0.8020	0.7998	0.8065	0.8131	0.8176	0.8220 (40)
HLP (average)												0.8148
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9462 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	84.9253	83.6640	81.8879	78.6131	76.1609	73.4418	71.9731	73.7368	75.6572	78.5666	81.9089	84.6382 (42b)
Hot water usage for other uses	44.8021	43.1729	41.5437	39.9146	38.2854	36.6562	36.6562	38.2854	39.9146	41.5437	43.1729	44.8021 (42c)
Average daily hot water use (litres/day)												119.4683 (43)
Daily hot water use	129.7273	126.8369	123.4316	118.5276	114.4463	110.0981	108.6294	112.0222	115.5717	120.1104	125.0818	129.4402 (44)
Energy conte	205.4564	180.6141	189.7098	162.2584	154.0667	135.3784	131.3778	138.7069	142.5115	162.9887	178.2020	202.6721 (45)
Energy content (annual)										Total = $\text{Sum}(45)\text{m} =$		1983.9429
Distribution loss (46)m = $0.15 \times (45)\text{m}$	30.8185	27.0921	28.4565	24.3388	23.1100	20.3068	19.7067	20.8060	21.3767	24.4483	26.7303	30.4008 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.3000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7020 (55)
Enter (49) or (54) in (55)												
Total storage loss	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	264.5164	233.9586	248.7698	219.4132	213.1267	192.5332	190.4378	197.7669	199.6663	222.0486	235.3568	261.7321 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	264.5164	233.9586	248.7698	219.4132	213.1267	192.5332	190.4378	197.7669	199.6663	222.0486	235.3568	261.7321 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = $\text{Sum}(64)\text{m} =$		2679.3263 (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) = $\text{Sum}(64a)\text{m} =$												0.0000 (64a)
Heat gains from water heating, kWh/month	115.5622	102.7298	110.3265	99.6748	98.4752	90.7372	90.9311	93.3680	93.1089	101.4417	104.9760	114.6365 (65)

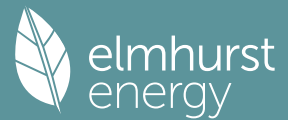
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.2923	185.2165	167.2923	172.8687	167.2923	172.8687	167.2923	167.2923	172.8687	167.2923	172.8687	167.2923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	329.1922	332.6082	324.0000	305.6742	282.5412	260.7995	246.2746	242.8587	251.4668	269.7926	292.9256	314.6674 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310 (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)	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482 (71)
Water heating gains (Table 5)	155.3256	152.8717	148.2883	138.4372	132.3591	126.0238	122.2192	125.4947	129.3179	136.3464	145.8000	154.0813 (72)
Total internal gains	719.0031	737.8894	706.7737	684.1732	649.3857	626.8851	602.9792	602.8387	620.8465	640.6243	678.7874	703.2340 (73)

6. Solar gains

[Jan]					Area	Solar flux	g		FF			Access	Gains
					m2	Table 6a	Specific data		Specific data			factor	W
						W/m2	or Table 6b		or Table 6c			Table 6d	
North					11.9900	10.6334	0.4500		0.8000			0.7700	31.8073 (74)
East					3.7500	19.6403	0.4500		0.8000			0.7700	18.3744 (76)
South					10.6700	46.7521	0.4500		0.8000			0.7700	124.4517 (78)
West					5.0600	19.6403	0.4500		0.8000			0.7700	24.7933 (80)
Solar gains	199.4267	349.0504	501.9888	662.1717	777.8444	787.9846	753.1507	664.5355	557.1449	392.3972	240.5812	169.5529	(83)
Total gains	918.4299	1086.9398	1208.7624	1346.3449	1427.2300	1414.8696	1356.1299	1267.3742	1177.9914	1033.0216	919.3686	872.7869	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	97.8127	98.0753	98.3393	99.6807	99.9534	101.3397	101.3397	101.6215	99.7806	99.9534	99.4095	98.8715
alpha	7.5208	7.5384	7.5560	7.6454	7.6636	7.7560	7.7560	7.7748	7.7187	7.6636	7.6273	7.5914
util living area	0.9992	0.9967	0.9876	0.9383	0.7931	0.5702	0.4111	0.4583	0.7252	0.9647	0.9970	0.9994 (86)
Living	20.3558	20.4739	20.6275	20.8189	20.9292	20.9577	20.9597	20.9596	20.9476	20.7981	20.5426	20.3388
Non living	19.6303	19.7496	19.9028	20.0919	20.1834	20.2106	20.2114	20.2134	20.2019	20.0781	19.8267	19.6201
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	20.6705	20.4739	20.6275	20.8189	20.9292	20.9577	20.9597	20.9596	20.9476	20.7981	20.5426	20.4313 (87)
Th 2	20.2266	20.2285	20.2304	20.2400	20.2420	20.2516	20.2516	20.2535	20.2477	20.2420	20.2381	20.2343 (88)
util rest of house	0.9989	0.9955	0.9829	0.9173	0.7428	0.5052	0.3414	0.3843	0.6555	0.9481	0.9957	0.9992 (89)
MIT 2	19.9215	19.7496	19.9028	20.0919	20.1834	20.2106	20.2114	20.2134	20.2019	20.0781	19.8267	19.7060 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.0226	19.8473	20.0006	20.1900	20.2840	20.3114	20.3124	20.3141	20.3025	20.1753	19.9233	19.8308 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0226	19.8473	20.0006	20.1900	20.2840	20.3114	20.3124	20.3141	20.3025	20.1753	19.9233	19.8038 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9987	0.9947	0.9812	0.9157	0.7458	0.5104	0.3470	0.3903	0.6608	0.9463	0.9950	0.9991 (94)
Useful gains	917.2790	1081.1847	1185.9893	1232.8109	1064.4231	722.1918	470.6160	494.6950	778.4150	977.5115	914.7701	871.9601 (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	2065.3775	1958.2757	1763.9920	1455.3026	1103.4803	724.1577	470.6998	494.8965	790.7904	1230.9016	1657.4609	2027.8267 (97)
Space heating kWh	854.1853	589.4052	430.0340	160.1940	29.0585	0.0000	0.0000	0.0000	0.0000	188.5222	534.7374	859.9647 (98a)
Space heating requirement - total per year (kWh/year)												3646.1014
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	854.1853	589.4052	430.0340	160.1940	29.0585	0.0000	0.0000	0.0000	0.0000	188.5222	534.7374	859.9647 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3646.1014
Space heating per m2										(98c) / (4) =		23.0635 (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 %)												263.2643 (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	854.1853	589.4052	430.0340	160.1940	29.0585	0.0000	0.0000	0.0000	0.0000	188.5222	534.7374	859.9647 (98)
Space heating efficiency (main heating system 1)	263.2643	263.2643	263.2643	263.2643	263.2643	0.0000	0.0000	0.0000	0.0000	263.2643	263.2643	263.2643 (210)
Space heating fuel (main heating system)	324.4593	223.8835	163.3469	60.8491	11.0378	0.0000	0.0000	0.0000	0.0000	71.6095	203.1181	326.6546 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	264.5164	233.9586	248.7698	219.4132	213.1267	192.5332	190.4378	197.7669	199.6663	222.0486	235.3568	261.7321 (64)
Efficiency of water heater												278.6931 (216)
(217)m	278.6931	278.6931	278.6931	278.6931	278.6931	278.6931	278.6931	278.6931	278.6931	278.6931	278.6931	278.6931 (217)
Fuel for water heating, kWh/month	94.9131	83.9485	89.2630	78.7293	76.4736	69.0843	68.3324	70.9623	71.6438	79.6750	84.4502	93.9141 (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	40.8129	36.8633	40.8129	39.4964	40.8129	39.4964	40.8129	39.4964	40.8129	39.4964	40.8129	40.8129 (221)
Lighting	35.5652	28.5318	25.6897	18.8214	14.5382	11.8778	13.2622	17.2387	22.3914	29.3787	33.1832	36.5537 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1384.9588 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												278.6931
Water heating fuel used												961.3897 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)												
mechanical ventilation fans (SFP = 0.9240)												480.5392 (230a)
Total electricity for the above, kWh/year												480.5392 (231)

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Electricity for lighting (calculated in Appendix L)	287.0319 (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	3113.9195 (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	1384.9588	0.1571	217.5131 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	961.3897	0.1408	135.3718 (264)
Space and water heating			352.8849 (265)
Pumps, fans and electric keep-hot	480.5392	0.1387	66.6567 (267)
Energy for lighting	287.0319	0.1443	41.4276 (268)
Total CO2, kg/year			460.9692 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9200 (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	1384.9588	1.5814	2190.1831 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	961.3897	1.5207	1461.9409 (278)
Space and water heating			3652.1240 (279)
Pumps, fans and electric keep-hot	480.5392	1.5128	726.9597 (281)
Energy for lighting	287.0319	1.5338	440.2591 (282)
Total Primary energy kWh/year			4819.3428 (286)
Dwelling Primary energy Rate (DPER)			30.4800 (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	79.9800 (1b)	x 2.4000 (2b)	= 191.9520 (1b) - (3b)
First floor	78.1100 (1c)	x 3.0000 (2c)	= 234.3300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	158.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	426.2820 (5)

2. Ventilation rate

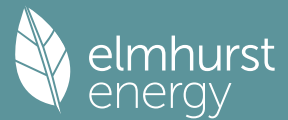
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0938 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3438 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3438 (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	0.4384	0.4298	0.4212	0.3782	0.3696	0.3266	0.3266	0.3180	0.3438	0.3696	0.3868	0.4040 (22b)
Effective ac	0.5961	0.5924	0.5887	0.5715	0.5683	0.5533	0.5533	0.5506	0.5591	0.5683	0.5748	0.5816 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opaque door			2.1800	1.0000	2.1800		(26)
TER Opening Type			31.4700	1.1450	36.0344		(27)
Heatloss Floor 1			79.9800	0.1300	10.3974		(28a)
00 External Wall	82.3900	23.5400	58.8500	0.1800	10.5930		(29a)
00 External Wall Garage	14.1100		14.1100	0.1800	2.5398		(29a)
01 External Wall	119.1000	10.1100	108.9900	0.1800	19.6182		(29a)
External Roof 1	111.7700		111.7700	0.1100	12.2947		(30)
Total net area of external elements Aum(A, m2)			407.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		93.6575		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							292.5963 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				23.7000	0.0500	1.1850	
E3 Sill				22.6600	0.0500	1.1330	
E4 Jamb				47.2400	0.0500	2.3620	
E5 Ground floor (normal)				40.2100	0.1600	6.4336	
E6 Intermediate floor within a dwelling				39.7600	0.0000	0.0000	
E16 Corner (normal)				32.4000	0.0900	2.9160	
E17 Corner (inverted - internal area greater than external area)				21.6000	-0.0900	-1.9440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0856 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	105.7431 (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	83.8542	83.3293	82.8147	80.3981	79.9459	77.8411	77.8411	77.4513	78.6519	79.9459	80.8606	81.8169	(38)
Average = Sum(39)m / 12 =	189.5972	189.0723	188.5578	186.1411	185.6890	183.5842	183.5842	183.1944	184.3949	185.6890	186.6037	187.5600	(39)
												186.1390	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1993	1.1960	1.1927	1.1774	1.1746	1.1613	1.1613	1.1588	1.1664	1.1746	1.1804	1.1864	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

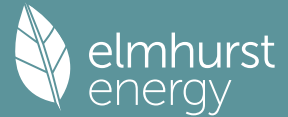
Assumed occupancy													2.9462 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
84.9253	83.6640	81.8879	78.6131	76.1609	73.4418	71.9731	73.7368	75.6572	78.5666	81.9089	84.6382		(42b)
Hot water usage for other uses													
44.8021	43.1729	41.5437	39.9146	38.2854	36.6562	36.6562	38.2854	39.9146	41.5437	43.1729	44.8021		(42c)
Average daily hot water use (litres/day)												119.4683	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.7273	126.8369	123.4316	118.5276	114.4463	110.0981	108.6294	112.0222	115.5717	120.1104	125.0818	129.4402	(44)
Energy conte	205.4564	180.6141	189.7098	162.2584	154.0667	135.3784	131.3778	138.7069	142.5115	162.9887	178.2020	202.6721	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
30.8185	27.0921	28.4565	24.3388	23.1100	20.3068	19.7067	20.8060	21.3767	24.4483	26.7303	30.4008		(46)
Water storage loss (or HIU 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	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	27.6637	26.7713	27.6637	26.7713	27.6637	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
256.3825	226.6118	240.6359	211.5417	204.9928	184.6617	182.3039	189.6330	191.7948	213.9147	227.4853	253.5982		(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													
256.3825	226.6118	240.6359	211.5417	204.9928	184.6617	182.3039	189.6330	191.7948	213.9147	227.4853	253.5982		(64)
12Total per year (kWh/year)												2583.5564	(64)
Electric shower(s)												2584	(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													
109.0551	96.8524	103.8194	93.3776	91.9680	84.4400	84.4240	86.8609	86.8117	94.9346	98.6788	108.1293		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	147.3102	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.2923	185.2165	167.2923	172.8687	167.2923	172.8687	167.2923	167.2923	172.8687	167.2923	172.8687	167.2923	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	329.1922	332.6082	324.0000	305.6742	282.5412	260.7995	246.2746	242.8587	251.4668	269.7926	292.9256	314.6674	(68)
Pumps, fans	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	37.7310	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	-117.8482	(71)
Total internal gains	146.5795	144.1256	139.5422	129.6910	123.6130	117.2777	113.4731	116.7485	120.5718	127.6003	137.0539	145.3351	(72)
	713.2570	732.1433	701.0276	678.4271	643.6396	618.1390	594.2331	594.0926	612.1004	634.8782	673.0413	697.4879	(73)

6. Solar gains

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[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North		11.9900	10.6334	0.6300	0.7000	0.7700	38.9639 (74)
East		3.7500	19.6403	0.6300	0.7000	0.7700	22.5087 (76)
South		10.6700	46.7521	0.6300	0.7000	0.7700	152.4534 (78)
West		5.0600	19.6403	0.6300	0.7000	0.7700	30.3717 (80)

Solar gains	244.2977	427.5868	614.9362	811.1604	952.8594	965.2811	922.6096	814.0560	682.5025	480.6866	294.7120	207.7023 (83)
Total gains	957.5548	1159.7301	1315.9638	1489.5875	1596.4989	1583.4201	1516.8427	1408.1486	1294.6029	1115.5648	967.7532	905.1902 (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	67.7702	67.9583	68.1438	69.0285	69.1966	69.9899	69.9899	70.1388	69.6822	69.1966	68.8574	68.5063
alpha	5.5180	5.5306	5.5429	5.6019	5.6131	5.6660	5.6660	5.6759	5.6455	5.6131	5.5905	5.5671
util living area	0.9990	0.9970	0.9909	0.9643	0.8800	0.7011	0.5254	0.5850	0.8421	0.9801	0.9975	0.9993 (86)
MIT	19.6899	19.8801	20.1512	20.5145	20.8084	20.9614	20.9936	20.9887	20.8914	20.5013	20.0316	19.6654 (87)
Th 2	19.9206	19.9232	19.9258	19.9381	19.9404	19.9511	19.9511	19.9531	19.9470	19.9404	19.9357	19.9309 (88)
util rest of house	0.9987	0.9958	0.9870	0.9484	0.8302	0.6040	0.4041	0.4591	0.7624	0.9683	0.9962	0.9990 (89)
MIT 2	18.3949	18.6402	18.9871	19.4481	19.7840	19.9312	19.9494	19.9497	19.8772	19.4407	18.8437	18.3710 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.5696	18.8075	19.1441	19.5920	19.9222	20.0702	20.0903	20.0899	20.0141	19.5838	19.0040	18.5456 (92)
Temperature adjustment												
adjusted MIT	18.5696	18.8075	19.1441	19.5920	19.9222	20.0702	20.0903	20.0899	20.0141	19.5838	19.0040	18.5456 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9979	0.9939	0.9830	0.9418	0.8292	0.6158	0.4206	0.4761	0.7682	0.9628	0.9946	0.9985 (94)
Useful gains	955.5463	1152.6897	1293.6294	1402.8596	1323.8205	975.0026	637.9511	670.4731	994.5662	1074.0465	962.4832	903.7936 (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	2705.4851	2629.5148	2384.1513	1990.2139	1526.7759	1004.2405	640.7646	675.9698	1090.5224	1668.1971	2221.3228	2690.6641 (97)
Space heating kWh	1301.9545	992.4264	811.3482	422.8951	150.9988	0.0000	0.0000	0.0000	0.0000	442.0480	906.3645	1329.4317 (98a)
Space heating requirement - total per year (kWh/year)	6357.4672											
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	1301.9545	992.4264	811.3482	422.8951	150.9988	0.0000	0.0000	0.0000	0.0000	442.0480	906.3645	1329.4317 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6357.4672											
Space heating per m2	(98c) / (4) = 40.2142 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1301.9545	992.4264	811.3482	422.8951	150.9988	0.0000	0.0000	0.0000	0.0000	442.0480	906.3645	1329.4317 (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)	1410.5682	1075.2182	879.0338	458.1745	163.5957	0.0000	0.0000	0.0000	0.0000	478.9252	981.9767	1440.3377 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.3825	226.6118	240.6359	211.5417	204.9928	184.6617	182.3039	189.6330	191.7948	213.9147	227.4853	253.5982 (64)
Efficiency of water heater (217)m	87.1823	86.9765	86.5667	85.5817	83.3847	79.8000	79.8000	79.8000	79.8000	85.6499	86.8351	79.8000 (216)
Fuel for water heating, kWh/month	294.0763	260.5438	277.9774	247.1810	245.8399	231.4057	228.4510	237.6353	240.3444	249.7549	261.9738	290.7433 (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	34.7600	27.8858	25.1081	18.3952	14.2090	11.6089	12.9619	16.8484	21.8844	28.7136	32.4319	35.7261 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-68.8780	-94.2161	-131.4036	-143.1399	-150.4656	-138.9262	-137.0256	-131.1080	-120.3056	-105.3270	-74.6109	-59.8777 (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)	-48.2284	-100.2189	-197.0255	-292.9135	-384.5482	-385.5293	-381.1558	-324.1206	-239.3313	-142.5052	-64.1029	-38.2482 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												6887.8301	(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												3065.9267	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												280.5334	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3953.2121	(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												6367.0781	(238)

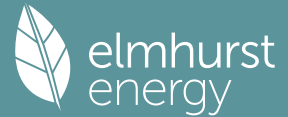
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6887.8301	0.2100	1446.4443 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3065.9267	0.2100	643.8446 (264)
Space and water heating			2090.2889 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	280.5334	0.1443	40.4896 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1355.2843	0.1353	-183.3301
PV Unit electricity exported	-2597.9277	0.1262	-327.8324
Total			-511.1625 (269)
Total CO2, kg/year			1631.5454 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3200 (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	6887.8301	1.1300	7783.2480 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3065.9267	1.1300	3464.4972 (278)
Space and water heating			11247.7452 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	280.5334	1.5338	430.2915 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1355.2843	1.5000	-2032.8928
PV Unit electricity exported	-2597.9277	0.4632	-1203.4028
Total			-3236.2956 (283)
Total Primary energy kWh/year			8571.8419 (286)
Target Primary Energy Rate (TPER)			54.2200 (287)

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Plot Reference	Plot 27				Issued on Date	17/12/2025	
Assessment Reference	Plot 27			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	88 B	DER	2.70	TER	10.49		
Environmental	98 A	% DER < TER				74.26	
CO ₂ Emissions (t/year)	0.26	DFEE	35.26	TFEE	38.08		
Compliance Check	See BREL	% DFEE < TFEE				7.41	
% DPER < TPER	47.84	DPER	28.57	TPER	54.77		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	54.2000 (1b)	x 2.4000 (2b)	= 130.0800 (1b) - (3b)
First floor	54.2000 (1c)	x 3.0000 (2c)	= 162.6000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 292.6800 (5)

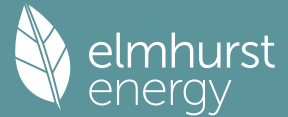
2. Ventilation rate

											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											2.0000 (17)		
Infiltration rate											0.1000 (18)		
Number of sides sheltered											1 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] = 0.9250 (20)		
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) = 0.0925 (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)
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													
	0.1179	0.1156	0.1133	0.1018	0.0994	0.0879	0.0879	0.0856	0.0925	0.0994	0.1041	0.1087	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													83.7000 (23c)
Effective ac	0.1994	0.1971	0.1948	0.1832	0.1809	0.1694	0.1694	0.1671	0.1740	0.1809	0.1856	0.1902	(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							
Glazing			15.2800	0.7752	11.8450		(27)
Front Door			2.2100	1.0000	2.2100		(26)
Heatloss Floor 1			54.2000	0.0800	4.3360	75.0000	4065.0000 (28a)
00 External Wall	39.6900	13.2900	26.4000	0.1000	2.6400	190.0000	5015.9997 (29a)
00 External Wall Garage	13.7200		13.7200	0.1000	1.3720	190.0000	2606.8001 (29a)
01 External Wall	67.3500	4.2000	63.1500	0.1000	6.3150	190.0000	11998.4997 (29a)
External Roof 1	54.2000		54.2000	0.0900	4.8780	9.0000	487.8000 (30)
Total net area of external elements Aum (A, m ²)			229.1600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.5960		(33)
Main dwelling							
00 Party Wall			21.3600	0.0000	0.0000	180.0000	3844.8001 (32)
01 Party Wall			26.7000	0.0000	0.0000	180.0000	4806.0001 (32)
00 Internal Wall			67.2000			9.0000	604.8000 (32c)
01 Internal Wall			124.2000			9.0000	1117.8000 (32c)

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Internal Floor 1	54.2000										18.0000	975.6000	(32d)		
00 Internal Ceiling	54.2000										9.0000	487.8000	(32e)		
Heat capacity Cm = Sum(A x k)												(28)...(30) + (32) + (32a)...(32e) =	36010.8997	(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													332.2039	(35)	
Thermal bridges (User defined value 0.100 * total exposed area)													22.9160	(36)	
Point Thermal bridges												(36a) =	0.0000		
Total fabric heat loss												(33) + (36) + (36a) =	56.5120	(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	19.2626	19.0392	18.8158	17.6991	17.4757	16.3590	16.3590	16.1356	16.8057	17.4757	17.9224	18.3691	(38)		
Average = Sum(39)m / 12 =	75.7745	75.5512	75.3278	74.2111	73.9877	72.8709	72.8709	72.6476	73.3176	73.9877	74.4344	74.8811	(39)		
												74.1552			
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	0.6990	0.6970	0.6949	0.6846	0.6825	0.6722	0.6722	0.6702	0.6764	0.6825	0.6867	0.6908	(40)		
Days in month	31	28	31	30	31	30	31	31	30	31	30	31			

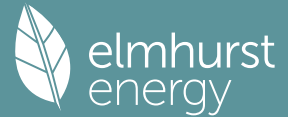
4. Water heating energy requirements (kWh/year)															
Assumed occupancy													2.8049	(42)	
Hot water usage for mixer showers															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)		
Hot water usage for baths															
	82.1817	80.9612	79.2424	76.0734	73.7004	71.0692	69.6480	71.3547	73.2130	76.0285	79.2628	81.9038	(42b)		
Hot water usage for other uses															
	43.3547	41.7782	40.2016	38.6251	37.0486	35.4720	35.4720	37.0486	38.6251	40.2016	41.7782	43.3547	(42c)		
Average daily hot water use (litres/day)													115.6087	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Energy content	125.5364	122.7393	119.4441	114.6985	110.7490	106.5412	105.1200	108.4032	111.8381	116.2301	121.0410	125.2586	(44)		
Energy content (annual)	198.8189	174.7792	183.5811	157.0165	149.0894	131.0049	127.1335	134.2259	137.9075	157.7232	172.4450	196.1246	(45)		
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m =	1919.8497	
	29.8228	26.2169	27.5372	23.5525	22.3634	19.6507	19.0700	20.1339	20.6861	23.6585	25.8668	29.4187	(46)		
Water storage loss (or HIU loss):															
Store volume													200.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):													1.3000	(48)	
Temperature factor from Table 2b													0.5400	(49)	
Enter (49) or (54) in (55)													0.7020	(55)	
Total storage loss															
	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(56)		
If cylinder contains dedicated solar storage															
	21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(57)		
Primary loss													37.2980	(59)	
	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980	(59)		
Combi loss													0.0000	(61)	
	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															
	257.8789	228.1237	242.6410	214.1713	208.1494	188.1597	186.1935	193.2858	195.0623	216.7831	229.5998	255.1846	(62)		
WWHRS													0.0000	(63a)	
	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	(63b)	
	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	(63c)	
	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	(63d)	
	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															
	257.8789	228.1237	242.6410	214.1713	208.1494	188.1597	186.1935	193.2858	195.0623	216.7831	229.5998	255.1846	(64)		
Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m =	2615.2331	(64)
Electric shower(s)													0.0000	(64a)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)	
Heat gains from water heating, kWh/month															
	113.3553	100.7897	108.2887	97.9318	96.8202	89.2830	89.5199	91.8781	91.5781	99.6909	103.0618	112.4594	(65)		

5. Internal gains (see Table 5 and 5a)															
Metabolic gains (Table 5), Watts															
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	(66)		
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	145.4714	161.0576	145.4714	150.3205	145.4714	150.3205	145.4714	145.4714	150.3205	145.4714	150.3205	145.4714	(67)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	269.2369	272.0307	264.9904	250.0022	231.0824	213.3004	201.4210	198.6272	205.6675	220.6557	239.5755	257.3575	(68)		
Pumps, fans	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	(69)		
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)		
Water heating gains (Table 5)	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	(71)		
Total internal gains	152.3592	149.9846	145.5493	136.0164	130.1347	124.0041	120.3224	123.4920	127.1918	133.9932	143.1414	151.1551	(72)		
	632.1406	648.1461	621.0842	601.4122	571.7616	552.6981	532.2879	532.6637	548.2529	565.1934	598.1105	619.0571	(73)		

6. Solar gains															
[Jan]	Area					Solar flux					Access		Gains		
	m2					Table 6a					factor		W		
						Specific data									
						or Table 6b									
East	4.9900					19.6403					0.7700		24.4503	(76)	
South	0.6700					46.7521					0.7700		7.8147	(78)	
West	9.6200					19.6403					0.7700		47.1366	(80)	

Solar gains	79.4015	152.8375	246.9273	354.7778	431.4128	440.4505	419.7892	362.6175	285.2561	179.9725	98.5235	65.6221	(83)		
Total gains	711.5422	800.9836	868.0115	956.1900	1003.1744	993.1486	952.0771	895.2812	833.5090	745.1658	696.6339	684.6792	(84)		

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7. Mean internal temperature (heating season)

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

21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	132.0105	132.4007	132.7933	134.7916	135.1985	137.2705	137.2705	137.6925	136.4341	135.1985	134.3872	133.5855
alpha	9.8007	9.8267	9.8529	9.9861	10.0132	10.1514	10.1514	10.1795	10.0956	10.0132	9.9591	9.9057
util living area	0.9984	0.9943	0.9767	0.8778	0.6809	0.4695	0.3368	0.3733	0.6054	0.9231	0.9936	0.9989 (86)
Living	20.6187	20.7037	20.8143	20.9318	20.9657	20.9692	20.9693	20.9694	20.9683	20.9173	20.7526	20.6066
Non living	19.9915	20.0774	20.1861	20.2979	20.3235	20.3347	20.3347	20.3366	20.3306	20.2900	20.1343	19.9861
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	20.8049	20.7037	20.8143	20.9318	20.9657	20.9692	20.9693	20.9694	20.9683	20.9173	20.7526	20.6616 (87)
Th 2	20.3417	20.3435	20.3453	20.3545	20.3563	20.3654	20.3654	20.3672	20.3618	20.3563	20.3526	20.3490 (88)
util rest of house	0.9978	0.9921	0.9682	0.8470	0.6358	0.4230	0.2882	0.3219	0.5502	0.8941	0.9906	0.9984 (89)
MIT 2	20.1626	20.0774	20.1861	20.2979	20.3235	20.3347	20.3347	20.3366	20.3306	20.2900	20.1343	20.0368 (90)
Living area fraction									FLA = Living area / (4) =			0.1360 (91)
MIT	20.2499	20.1625	20.2715	20.3841	20.4108	20.4210	20.4210	20.4227	20.4173	20.3753	20.2184	20.1218 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2499	20.1625	20.2715	20.3841	20.4108	20.4210	20.4210	20.4227	20.4173	20.3753	20.2184	20.1218 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9977	0.9913	0.9670	0.8485	0.6397	0.4271	0.2925	0.3264	0.5550	0.8950	0.9898	0.9982 (94)
Useful gains	709.9099	794.0348	839.4046	811.3326	641.7278	424.1354	278.4382	292.2337	462.6207	666.9495	689.5448	683.4781 (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	1208.5965	1153.1032	1037.3767	852.2457	644.4932	424.1786	278.4389	292.2359	463.1677	723.2539	976.4608	1192.2417 (97)
Space heating kWh	371.0229	241.2940	147.2912	29.4574	2.0575	0.0000	0.0000	0.0000	0.0000	41.8905	206.5796	378.5201 (98a)
Space heating requirement - total per year (kWh/year)												1418.1130
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	371.0229	241.2940	147.2912	29.4574	2.0575	0.0000	0.0000	0.0000	0.0000	41.8905	206.5796	378.5201 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1418.1130
Space heating per m2										(98c) / (4) =		13.0822 (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 %)

273.3030 (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	371.0229	241.2940	147.2912	29.4574	2.0575	0.0000	0.0000	0.0000	0.0000	41.8905	206.5796	378.5201 (98)
Space heating efficiency (main heating system 1)	273.3030	273.3030	273.3030	273.3030	273.3030	0.0000	0.0000	0.0000	0.0000	273.3030	273.3030	273.3030 (210)
Space heating fuel (main heating system)	135.7552	88.2881	53.8930	10.7783	0.7528	0.0000	0.0000	0.0000	0.0000	15.3275	75.5863	138.4983 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	257.8789	228.1237	242.6410	214.1713	208.1494	188.1597	186.1935	193.2858	195.0623	216.7831	229.5998	255.1846 (64)
Efficiency of water heater	285.7982	285.7982	285.7982	285.7982	285.7982	285.7982	285.7982	285.7982	285.7982	285.7982	285.7982	285.7982 (216)
Fuel for water heating, kWh/month	90.2311	79.8198	84.8994	74.9379	72.8309	65.8366	65.1486	67.6302	68.2518	75.8518	80.3363	89.2884 (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	28.0216	25.3099	28.0216	27.1177	28.0216	27.1177	28.0216	28.0216	27.1177	28.0216	27.1177	28.0216 (231)
Lighting	30.9263	24.8102	22.3388	16.3664	12.6419	10.3285	11.5323	14.9902	19.4707	25.5467	28.8549	31.7858 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												518.8795 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.7982
Water heating fuel used												915.0629 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)
mechanical ventilation fans (SFP = 0.9240)

329.9323 (230a)

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Total electricity for the above, kWh/year	329.9323	(231)
Electricity for lighting (calculated in Appendix L)	249.5927	(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	2013.4674	(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	518.8795	0.1584	82.2138 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	915.0629	0.1408	128.8321 (264)
Space and water heating			211.0459 (265)
Pumps, fans and electric keep-hot	329.9323	0.1387	45.7657 (267)
Energy for lighting	249.5927	0.1443	36.0239 (268)
Total CO2, kg/year			292.8355 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7000 (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	518.8795	1.5865	823.2045 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	915.0629	1.5206	1391.4322 (278)
Space and water heating			2214.6366 (279)
Pumps, fans and electric keep-hot	329.9323	1.5128	499.1216 (281)
Energy for lighting	249.5927	1.5338	382.8336 (282)
Total Primary energy kWh/year			3096.5919 (286)
Dwelling Primary energy Rate (DPER)			28.5700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	54.2000 (1b)	x 2.4000 (2b)	= 130.0800 (1b) - (3b)
First floor	54.2000 (1c)	x 3.0000 (2c)	= 162.6000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	292.6800 (5)

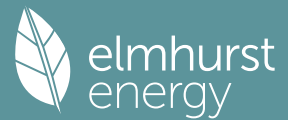
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1367 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3867 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3577 (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	0.4560	0.4471	0.4381	0.3934	0.3845	0.3398	0.3398	0.3308	0.3577	0.3845	0.4024	0.4203 (22b)
Effective ac	0.6040	0.5999	0.5960	0.5774	0.5739	0.5577	0.5577	0.5547	0.5640	0.5739	0.5810	0.5883 (25)

3. Heat losses and heat loss parameter

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Element													
Main dwelling				Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K			
TER Opaque door						2.2100	1.0000	2.2100				(26)	
TER Opening Type						15.2800	1.1450	17.4962				(27)	
Heatloss Floor 1						54.2000	0.1300	7.0460				(28a)	
00 External Wall				39.6900	13.2900	26.4000	0.1800	4.7520				(29a)	
00 External Wall Garage				13.7200		13.7200	0.1800	2.4696				(29a)	
01 External Wall				67.3500	4.2000	63.1500	0.1800	11.3670				(29a)	
External Roof 1				54.2000		54.2000	0.1100	5.9620				(30)	
Total net area of external elements Aum(A, m2)						229.1600						(31)	
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		51.3028				(33)	
Main dwelling													
00 Party Wall						21.3600	0.0000	0.0000				(32)	
01 Party Wall						26.7000	0.0000	0.0000				(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											332.2039	(35)	
List of Thermal Bridges													
K1 Element							Length	Psi-value		Total			
E1 Steel lintel with perforated steel base plate							12.3800	0.0500		0.6190			
E3 Sill							11.3300	0.0500		0.5665			
E4 Jamb							24.9800	0.0500		1.2490			
E5 Ground floor (normal)							22.4500	0.1600		3.5920			
E6 Intermediate floor within a dwelling							22.4500	0.0000		0.0000			
E16 Corner (normal)							16.2000	0.0900		1.4580			
E18 Party wall between dwellings							10.8000	0.0600		0.6480			
E17 Corner (inverted - internal area greater than external area)							5.4000	-0.0900		-0.4860			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											7.6465	(36)	
Point Thermal Bridges										(36a) =	0.0000		
Total fabric heat loss										(33) + (36) + (36a) =	58.9493	(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	58.3351	57.9451	57.5628	55.7674	55.4315	53.8677	53.8677	53.5781	54.4700	55.4315	56.1110	56.8215	(38)
Average = Sum(39)m / 12 =	117.2843	116.8944	116.5121	114.7167	114.3808	112.8170	112.8170	112.5274	113.4193	114.3808	115.0603	115.7708	(39)
												114.7151	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0820	1.0784	1.0748	1.0583	1.0552	1.0407	1.0407	1.0381	1.0463	1.0552	1.0614	1.0680	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.0583	
												31	

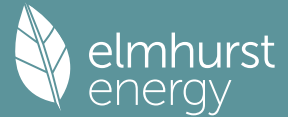
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.8049 (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													
	82.1817	80.9612	79.2424	76.0734	73.7004	71.0692	69.6480	71.3547	73.2130	76.0285	79.2628	81.9038	(42b)
Hot water usage for other uses													
	43.3547	41.7782	40.2016	38.6251	37.0486	35.4720	35.4720	37.0486	38.6251	40.2016	41.7782	43.3547	(42c)
Average daily hot water use (litres/day)													115.6087 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	125.5364	122.7393	119.4441	114.6985	110.7490	106.5412	105.1200	108.4032	111.8381	116.2301	121.0410	125.2586	(44)
Energy conte	198.8189	174.7792	183.5811	157.0165	149.0894	131.0049	127.1335	134.2259	137.9075	157.7232	172.4450	196.1246	(45)
Energy content (annual)										Total = Sum(45)m =		1919.8497	
Distribution loss (46)m = 0.15 x (45)m													
	29.8228	26.2169	27.5372	23.5525	22.3634	19.6507	19.0700	20.1339	20.6861	23.6585	25.8668	29.4187	(46)
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	249.7450	220.7769	234.5071	206.2998	200.0155	180.2882	178.0596	185.1519	187.1908	208.6492	221.7283	247.0507	(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													
	249.7450	220.7769	234.5071	206.2998	200.0155	180.2882	178.0596	185.1519	187.1908	208.6492	221.7283	247.0507	(64)
										Total per year (kWh/year) = Sum(64)m =		2519.4632	(64)
12Total per year (kWh/year)												2519	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
	106.8482	94.9123	101.7816	91.6346	90.3131	82.9858	83.0128	85.3710	85.2809	93.1838	96.7646	105.9523	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	140.2437	(66)
	145.4714	161.0576	145.4714	150.3205	145.4714	150.3205	145.4714	145.4714	150.3205	145.4714	150.3205	145.4714	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	269.2369	272.0307	264.9904	250.0022	231.0824	213.3004	201.4210	198.6272	205.6675	220.6557	239.5755	257.3575	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	37.0244	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	-112.1949	(71)
Water heating gains (Table 5)													
	143.6131	141.2385	136.8032	127.2703	121.3886	115.2580	111.5763	114.7459	118.4457	125.2471	134.3953	142.4090	(72)
Total internal gains													
	626.3945	642.4000	615.3381	595.6661	566.0155	543.9520	523.5418	523.9176	539.5068	559.4472	592.3643	613.3110	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East				4.9900	19.6403	0.6300		0.7000		0.7700		29.9516 (76)	
South				0.6700	46.7521	0.6300		0.7000		0.7700		9.5730 (78)	
West				9.6200	19.6403	0.6300		0.7000		0.7700		57.7423 (80)	
Solar gains	97.2669	187.2259	302.4860	434.6028	528.4807	539.5519	514.2417	444.2065	349.4387	220.4663	120.6912	80.3871 (83)	
Total gains	723.6614	829.6259	917.8240	1030.2689	1094.4962	1083.5039	1037.7835	968.1241	888.9455	779.9135	713.0556	693.6981 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.2887	85.5732	85.8540	87.1977	87.4538	88.6660	88.6660	88.8941	88.1951	87.4538	86.9372	86.4037
alpha	6.6859	6.7049	6.7236	6.8132	6.8303	6.9111	6.9111	6.9263	6.8797	6.8303	6.7958	6.7602
util living area	0.9992	0.9977	0.9924	0.9625	0.8595	0.6524	0.4768	0.5314	0.8112	0.9800	0.9977	0.9994 (86)
MIT	20.0206	20.1639	20.3822	20.6847	20.9021	20.9879	20.9987	20.9975	20.9510	20.6616	20.2941	20.0058 (87)
Th 2	20.0156	20.0185	20.0214	20.0351	20.0376	20.0495	20.0495	20.0517	20.0449	20.0376	20.0324	20.0271 (88)
util rest of house	0.9988	0.9967	0.9888	0.9450	0.8050	0.5625	0.3747	0.4238	0.7277	0.9673	0.9965	0.9991 (89)
MIT 2	18.8760	19.0615	19.3414	19.7250	19.9635	20.0440	20.0492	20.0511	20.0169	19.7057	19.2393	18.8659 (90)
Living area fraction										fLA = Living area / (4) =		0.1360 (91)
MIT	19.0316	19.2114	19.4829	19.8555	20.0911	20.1724	20.1783	20.1798	20.1439	19.8357	19.3827	19.0209 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0316	19.2114	19.4829	19.8555	20.0911	20.1724	20.1783	20.1798	20.1439	19.8357	19.3827	19.0209 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9954	0.9860	0.9410	0.8084	0.5745	0.3887	0.4385	0.7372	0.9637	0.9952	0.9987 (94)
Useful gains	722.4100	825.8145	905.0077	969.4510	884.8054	622.4436	403.3361	424.5262	655.3613	751.5878	709.6576	692.7908 (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	1727.7903	1672.9207	1512.6675	1256.7826	959.7834	628.6588	403.6979	425.3278	685.4957	1056.3807	1413.2508	1715.8301 (97)
Space heating kWh	748.0030	569.2554	452.0988	206.8787	55.7836	0.0000	0.0000	0.0000	0.0000	226.7660	506.5871	761.1413 (98a)
Space heating requirement - total per year (kWh/year)												3526.5138
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	748.0030	569.2554	452.0988	206.8787	55.7836	0.0000	0.0000	0.0000	0.0000	226.7660	506.5871	761.1413 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3526.5138
Space heating per m ²										(98c) / (4) =		32.5324 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	748.0030	569.2554	452.0988	206.8787	55.7836	0.0000	0.0000	0.0000	0.0000	226.7660	506.5871	761.1413 (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)	810.4041	616.7447	489.8146	224.1373	60.4373	0.0000	0.0000	0.0000	0.0000	245.6836	548.8484	824.6384 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	249.7450	220.7769	234.5071	206.2998	200.0155	180.2882	178.0596	185.1519	187.1908	208.6492	221.7283	247.0507 (64)
Efficiency of water heater (217)m	86.3620	86.0868	85.5063	84.0661	81.6036	79.8000	79.8000	79.8000	79.8000	84.2469	85.8522	79.8000 (216)
Fuel for water heating, kWh/month	289.1840	256.4586	274.2572	245.4019	245.1062	225.9250	223.1323	232.0200	234.5750	247.6640	258.2674	285.8990 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	30.2261	24.2485	21.8331	15.9958	12.3557	10.0947	11.2712	14.6508	19.0299	24.9683	28.2016	31.0662 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-49.2147	-68.6203	-97.5367	-108.3678	-115.7205	-107.5502	-106.1677	-100.7572	-91.0738	-77.8139	-53.8142	-42.6346 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-30.1448	-63.1423	-125.0296	-187.1322	-246.8420	-247.8572	-244.9880	-207.7374	-152.6411	-90.1343	-40.1879	-23.8623 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												3820.7084	(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												3017.8906	(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)												243.9418	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2678.9708	(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												4489.5699	(238)

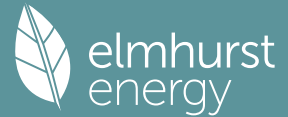
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3820.7084	0.2100	802.3488	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3017.8906	0.2100	633.7570	(264)
Space and water heating			1436.1058	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	243.9418	0.1443	35.2083	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1019.2716	0.1348	-137.4406	
PV Unit electricity exported	-1659.6993	0.1260	-209.1125	
Total			-346.5531	(269)
Total CO2, kg/year			1136.6903	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3820.7084	1.1300	4317.4005	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3017.8906	1.1300	3410.2163	(278)
Space and water heating			7727.6168	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	243.9418	1.5338	374.1661	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1019.2716	1.4984	-1527.2434	
PV Unit electricity exported	-1659.6993	0.4625	-767.5933	
Total			-2294.8367	(283)
Total Primary energy kWh/year			5937.0470	(286)
Target Primary Energy Rate (TPER)			54.7700	(287)

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Plot Reference	Plot 35				Issued on Date	17/12/2025	
Assessment Reference	Plot 35			Plot Type Ref	Plot 35		
Plot Address					SAP Version	10.2	
SAP Rating	87 B	DER	2.93	TER	10.73		
Environmental	97 A	% DER < TER				72.69	
CO ₂ Emissions (t/year)	0.29	DFEE	35.71	TFEE	38.96		
Compliance Check	See BREL	% DFEE < TFEE				8.32	
% DPER < TPER	44.72	DPER	30.99	TPER	56.06		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	54.1000 (1b)	x 2.4000 (2b)	= 129.8400 (1b) - (3b)
First floor	54.1000 (1c)	x 3.0000 (2c)	= 162.3000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 292.1400 (5)

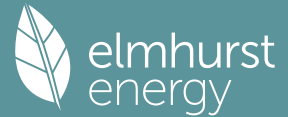
2. Ventilation rate

											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											2.0000 (17)		
Infiltration rate											0.1000 (18)		
Number of sides sheltered											1 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] = 0.9250 (20)		
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) = 0.0925 (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)	
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													
	0.1179	0.1156	0.1133	0.1018	0.0994	0.0879	0.0879	0.0856	0.0925	0.0994	0.1041	0.1087 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													
													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													83.7000 (23c)
Effective ac	0.1994	0.1971	0.1948	0.1832	0.1809	0.1694	0.1694	0.1671	0.1740	0.1809	0.1856	0.1902 (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							
Glazing			16.0800	0.7752	12.4651		(27)
Front Door			2.1900	1.0000	2.1900		(26)
Heatloss Floor 1			54.1000	0.0800	4.3280	75.0000	4057.5000 (28a)
00 External Wall	53.5600	10.8100	42.7500	0.1000	4.2750	190.0000	8122.5003 (29a)
01 External Wall	66.9600	7.4600	59.5000	0.1000	5.9500	190.0000	11304.9998 (29a)
External Roof 1	54.1000		54.1000	0.0900	4.8690	9.0000	486.9000 (30)
Total net area of external elements Aum(A, m ²)			228.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.0771		(33)
Main dwelling							
00 Party Wall			21.3600	0.0000	0.0000	180.0000	3844.8001 (32)
01 Party Wall			26.7000	0.0000	0.0000	180.0000	4806.0001 (32)
00 Internal Wall			74.7800			9.0000	673.0200 (32c)
01 Internal Wall			155.9400			9.0000	1403.4600 (32c)
Internal Floor 1			54.1000			18.0000	973.8000 (32d)

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00 Internal Ceiling	54.1000						9.0000				486.9000 (32e)		
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =				36159.8803 (34)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											334.1948 (35)		
Thermal bridges (User defined value 0.100 * total exposed area)											22.8720 (36)		
Point Thermal bridges											(36a) = 0.0000		
Total fabric heat loss							(33) + (36) + (36a) =				56.9491 (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	
	19.2270	19.0041	18.7811	17.6664	17.4435	16.3288	16.3288	16.1059	16.7747	17.4435	17.8894	18.3353	(38)
Heat transfer coeff	76.1761	75.9532	75.7302	74.6156	74.3926	73.2779	73.2779	73.0550	73.7238	74.3926	74.8385	75.2844	(39)
Average = Sum(39)m / 12 =	74.5598												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.7040	0.7020	0.6999	0.6896	0.6875	0.6772	0.6772	0.6752	0.6814	0.6875	0.6917	0.6958	(40)
HLP (average)	0.6891												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8036 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	82.1565	80.9364	79.2182	76.0501	73.6779	71.0475	69.6267	71.3329	73.1906	76.0052	79.2385	81.8788	(42b)
Hot water usage for other uses	43.3414	41.7654	40.1893	38.6133	37.0372	35.4612	35.4612	37.0372	38.6133	40.1893	41.7654	43.3414	(42c)
Average daily hot water use (litres/day)													115.5734 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	125.4980	122.7018	119.4075	114.6634	110.7151	106.5087	105.0879	108.3701	111.8039	116.1946	121.0039	125.2203	(44)
Energy content (annual)	198.7581	174.7257	183.5249	156.9685	149.0439	130.9648	127.0947	134.1848	137.8654	157.6749	172.3923	196.0647	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1919.2627
Water storage loss (or HIU loss):	29.8137	26.2089	27.5287	23.5453	22.3566	19.6447	19.0642	20.1277	20.6798	23.6512	25.8588	29.4097	(46)
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3000 (48)
Temperature factor from Table 2b													0.7800 (49)
Enter (49) or (54) in (55)													1.0140 (55)
Total storage loss	31.4340	28.3920	31.4340	30.4200	31.4340	30.4200	31.4340	31.4340	30.4200	31.4340	30.4200	31.4340	(56)
If cylinder contains dedicated solar storage	31.4340	28.3920	31.4340	30.4200	31.4340	30.4200	31.4340	31.4340	30.4200	31.4340	30.4200	31.4340	(57)
Primary loss	106.3213	96.0322	106.3213	102.8916	106.3213	36.0948	37.2980	37.2980	36.0948	106.3213	102.8916	106.3213	(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	336.5135	299.1499	321.2803	290.2801	286.7992	197.4796	195.8266	202.9168	204.3802	295.4303	305.7039	333.8200	(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	336.5135	299.1499	321.2803	290.2801	286.7992	197.4796	195.8266	202.9168	204.3802	295.4303	305.7039	333.8200	(64)
12Total per year (kWh/year)													3269.5802 (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	151.1441	134.9220	146.0791	134.5053	134.6141	72.4216	72.0973	74.4548	74.7161	137.4840	139.6337	150.2486	(65)

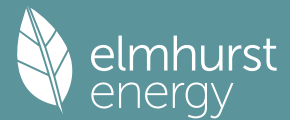
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.6768	159.0708	143.6768	148.4660	143.6768	148.4660	143.6768	143.6768	148.4660	143.6768	148.4660	143.6768	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.9441	271.7349	264.7022	249.7303	230.8311	213.0685	201.2019	198.4111	205.4439	220.4157	239.3149	257.0776	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	(71)
Water heating gains (Table 5)	203.1507	200.7768	196.3429	186.8129	180.9330	100.5856	96.9050	100.0737	103.7723	184.7903	193.9357	201.9470	(72)
Total internal gains	680.8253	696.6362	669.7755	650.0630	620.4946	527.1738	506.8375	507.2153	522.7359	613.9365	646.7704	667.7550	(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				9.7100	10.6334	0.4500	0.8000	0.7700	25.7589 (74)				
East				1.3100	19.6403	0.4500	0.8000	0.7700	6.4188 (76)				
South				5.0600	46.7521	0.4500	0.8000	0.7700	59.0183 (78)				
Solar gains	91.1960	158.4399	227.4504	303.6753	362.9656	371.1487	353.2726	306.8788	253.2394	177.7506	109.7372	77.7497	(83)
Total gains	772.0213	855.0761	897.2259	953.7383	983.4602	898.3225	860.1101	814.0941	775.9753	791.6871	756.5076	745.5047	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	131.8577	132.2448	132.6341	134.6155	135.0189	137.0728	137.0728	137.4911	136.2438	135.0189	134.2145	133.4196	
alpha	9.7905	9.8163	9.8423	9.9744	10.0013	10.1382	10.1382	10.1661	10.0829	10.0013	9.9476	9.8946	
util living area													
	0.9970	0.9908	0.9718	0.8820	0.6972	0.5217	0.3749	0.4128	0.6523	0.8983	0.9882	0.9978 (86)	
Living	20.6531	20.7326	20.8264	20.9300	20.9649	20.9690	20.9692	20.9693	20.9675	20.9295	20.7848	20.6414	
Non living	20.0215	20.1014	20.1930	20.2921	20.3186	20.3302	20.3302	20.3321	20.3258	20.2949	20.1612	20.0166	
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	20.8226	20.7326	20.8264	20.9300	20.9649	20.9690	20.9692	20.9693	20.9675	20.9295	20.7848	20.6916 (87)	
Th 2	20.3373	20.3391	20.3409	20.3500	20.3518	20.3610	20.3610	20.3628	20.3573	20.3518	20.3482	20.3446 (88)	
util rest of house													
	0.9959	0.9874	0.9617	0.8514	0.6512	0.4698	0.3204	0.3556	0.5932	0.8645	0.9830	0.9969 (89)	
MIT 2	20.1757	20.1014	20.1930	20.2921	20.3186	20.3302	20.3302	20.3321	20.3258	20.2949	20.1612	20.0624 (90)	
Living area fraction									fLA = Living area / (4) =				0.1335 (91)
MIT	20.2621	20.1857	20.2776	20.3773	20.4049	20.4155	20.4156	20.4172	20.4115	20.3796	20.2445	20.1465 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2621	20.1857	20.2776	20.3773	20.4049	20.4155	20.4156	20.4172	20.4115	20.3796	20.2445	20.1465 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9864	0.9606	0.8528	0.6550	0.4742	0.3251	0.3605	0.5983	0.8661	0.9820	0.9966 (94)
Useful gains	768.6964	843.4587	861.8873	813.3016	644.1616	426.0293	279.5939	293.4722	464.2289	685.7033	742.9243	742.9570 (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												
	1215.9318	1160.9962	1043.3796	856.3866	647.5836	426.1459	279.5961	293.4780	465.3058	727.5327	983.7117	1200.5196 (97)
Space heating kWh												
	332.7431	213.3852	135.0303	31.0212	2.5460	0.0000	0.0000	0.0000	0.0000	31.1211	173.3669	340.4266 (98a)
Space heating requirement - total per year (kWh/year)												1259.6404
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												
	332.7431	213.3852	135.0303	31.0212	2.5460	0.0000	0.0000	0.0000	0.0000	31.1211	173.3669	340.4266 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1259.6404
Space heating per m2										(98c) / (4) =		11.6418 (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 %)												273.3886 (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	332.7431	213.3852	135.0303	31.0212	2.5460	0.0000	0.0000	0.0000	0.0000	31.1211	173.3669	340.4266 (98)
Space heating efficiency (main heating system 1)	273.3886	273.3886	273.3886	273.3886	273.3886	0.0000	0.0000	0.0000	0.0000	273.3886	273.3886	273.3886 (210)
Space heating fuel (main heating system)	121.7107	78.0520	49.3913	11.3469	0.9313	0.0000	0.0000	0.0000	0.0000	11.3835	63.4141	124.5211 (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	336.5135	299.1499	321.2803	290.2801	286.7992	197.4796	195.8266	202.9168	204.3802	295.4303	305.7039	333.8200 (64)
Efficiency of water heater	285.8016	285.8016	285.8016	285.8016	285.8016	285.8016	285.8016	285.8016	285.8016	285.8016	285.8016	285.8016 (216)
Fuel for water heating, kWh/month	117.7437	104.6705	112.4137	101.5670	100.3490	69.0968	68.5184	70.9992	71.5112	103.3690	106.9637	116.8013 (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	27.9699	25.2632	27.9699	27.0677	27.9699	27.0677	27.9699	27.9699	27.0677	27.9699	27.0677	27.9699 (231)
Lighting	30.5447	24.5041	22.0633	16.1645	12.4859	10.2011	11.3901	14.8052	19.2305	25.2315	28.4989	31.3937 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												460.7508 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.8016
Water heating fuel used												1144.0035 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)												
mechanical ventilation fans (SFP = 0.9240)												329.3236 (230a)
Total electricity for the above, kWh/year												329.3236 (231)

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Electricity for lighting (calculated in Appendix L)	246.5136 (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	2180.5915 (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	460.7508	0.1585	73.0502 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1144.0035	0.1422	162.7307 (264)
Space and water heating			235.7809 (265)
Pumps, fans and electric keep-hot	329.3236	0.1387	45.6812 (267)
Energy for lighting	246.5136	0.1443	35.5795 (268)
Total CO2, kg/year			317.0417 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	460.7508	1.5869	731.1603 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1144.0035	1.5261	1745.8334 (278)
Space and water heating			2476.9937 (279)
Pumps, fans and electric keep-hot	329.3236	1.5128	498.2007 (281)
Energy for lighting	246.5136	1.5338	378.1108 (282)
Total Primary energy kWh/year			3353.3052 (286)
Dwelling Primary energy Rate (DPER)			30.9900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	54.1000 (1b)	x 2.4000 (2b)	= 129.8400 (1b) - (3b)
First floor	54.1000 (1c)	x 3.0000 (2c)	= 162.3000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 292.1400 (5)

2. Ventilation rate

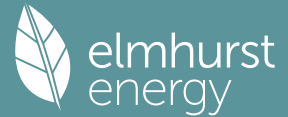
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1369 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3869 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3579 (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	0.4563	0.4474	0.4384	0.3937	0.3847	0.3400	0.3400	0.3311	0.3579	0.3847	0.4026	0.4205 (22b)
Effective ac	0.6041	0.6001	0.5961	0.5775	0.5740	0.5578	0.5578	0.5548	0.5640	0.5740	0.5811	0.5884 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Full SAP Calculation Printout



Main dwelling			m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K	
TER Opaque door							2.1900		1.0000		2.1900				(26)	
TER Opening Type							16.0800		1.1450		18.4122				(27)	
Heatloss Floor 1							54.1000		0.1300		7.0330				(28a)	
00 External Wall			53.5600		10.8100		42.7500		0.1800		7.6950				(29a)	
01 External Wall			66.9600		7.4600		59.5000		0.1800		10.7100				(29a)	
External Roof 1			54.1000				54.1000		0.1100		5.9510				(30)	
Total net area of external elements Aum(A, m2)							228.7200								(31)	
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =				51.9912				(33)	
Main dwelling																
00 Party Wall							21.3600		0.0000		0.0000				(32)	
01 Party Wall							26.7000		0.0000		0.0000				(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K															334.1948 (35)	
List of Thermal Bridges																
K1 Element									Length		Psi-value		Total			
E1 Steel lintel with perforated steel base plate									13.0000		0.0500		0.6500			
E3 Sill									11.9500		0.0500		0.5975			
E4 Jamb									27.1600		0.0500		1.3580			
E5 Ground floor (normal)									22.3200		0.1600		3.5712			
E6 Intermediate floor within a dwelling									22.3200		0.0000		0.0000			
E16 Corner (normal)									16.2000		0.0900		1.4580			
E18 Party wall between dwellings									10.8000		0.0600		0.6480			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)															8.2827 (36)	
Point Thermal bridges													(36a) =		0.0000	
Total fabric heat loss													(33) + (36) + (36a) =		60.2739 (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	58.2405	57.8508	57.4687	55.6743	55.3385	53.7756	53.7756	53.4862	54.3776	55.3385	56.0177	56.7278	(38)			
Average = Sum(39)m / 12 =	118.5144	118.1247	117.7426	115.9482	115.6124	114.0495	114.0495	113.7601	114.6515	115.6124	116.2916	117.0017	(39)			
												115.9466				
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP (average)	1.0953	1.0917	1.0882	1.0716	1.0685	1.0541	1.0541	1.0514	1.0596	1.0685	1.0748	1.0813	(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													2.8036 (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																
82.1565	80.9364	79.2182	76.0501	73.6779	71.0475	69.6267	71.3329	73.1906	76.0052	79.2385	81.8788	(42b)				
Hot water usage for other uses																
43.3414	41.7654	40.1893	38.6133	37.0372	35.4612	35.4612	37.0372	38.6133	40.1893	41.7654	43.3414	(42c)				
Average daily hot water use (litres/day)													115.5734 (43)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Daily hot water use	125.4980	122.7018	119.4075	114.6634	110.7151	106.5087	105.0879	108.3701	111.8039	116.1946	121.0039	125.2203	(44)			
Energy conte	198.7581	174.7257	183.5249	156.9685	149.0439	130.9648	127.0947	134.1848	137.8654	157.6749	172.3923	196.0647	(45)			
Energy content (annual)													Total = Sum(45)m = 1919.2627			
Distribution loss (46)m = 0.15 x (45)m																
29.8137	26.2089	27.5287	23.5453	22.3566	19.6447	19.0642	20.1277	20.6798	23.6512	25.8588	29.4097	(46)				
Water storage loss (or HIU loss):																
Store volume													200.0000 (47)			
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)			
Temperature factor from Table 2b													0.5400 (49)			
Enter (49) or (54) in (55)													0.8924 (55)			
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)			
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(57)			
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)			
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)			
Total heat required for water heating calculated for each month	249.6842	220.7235	234.4510	206.2518	199.9699	180.2481	178.0207	185.1109	187.1487	208.6010	221.6756	246.9907	(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	249.6842	220.7235	234.4510	206.2518	199.9699	180.2481	178.0207	185.1109	187.1487	208.6010	221.6756	246.9907	(64)			
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2518.8762 (64)			
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)			
													0.0000 (64a)			
Heat gains from water heating, kWh/month	106.8279	94.8945	101.7629	91.6187	90.2979	82.9724	82.9998	85.3573	85.2669	93.1678	96.7471	105.9324	(65)			

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

Metabolic gains (Table 5), Watts																
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)			
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.6768	159.0708	143.6768	148.4660	143.6768	148.4660	143.6768	143.6768	148.4660	143.6768	148.4660	143.6768	(67)			
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.9441	271.7349	264.7022	249.7303	230.8311	213.0685	201.2019	198.4111	205.4439	220.4157	239.3149	257.0776	(68)			
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	(69)			
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)			
Losses e.g. evaporation (negative values) (Table 5)	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	(71)			
Water heating gains (Table 5)	143.5859	141.2121	136.7781	127.2481	121.3682	115.2395	111.5589	114.7276	118.4262	125.2255	134.3709	142.3822	(72)			
Total internal gains	624.2605	640.0714	613.2107	593.4982	563.9298	541.8277	521.4913	521.8692	537.3898	557.3717	590.2056	611.1902	(73)			

[Jan]											Area		Solar flux		g		FF		Access		Gains		
											m2		Table 6a		Specific data		Specific data		factor		W		
											W/m2		or Table 6b		or Table 6c		Table 6d						
North											9.7100	10.6334		0.6300		0.7000		0.7700				31.5546 (74)	
East											1.3100	19.6403		0.6300		0.7000		0.7700				7.8630 (76)	
South											5.0600	46.7521		0.6300		0.7000		0.7700				72.2975 (78)	
Solar gains	111.7151	194.0889	278.6267	372.0022	444.6329	454.6572	432.7590	375.9265	310.2183	217.7445	134.4281	95.2433	(83)										
Total gains	735.9756	834.1603	891.8375	965.5004	1008.5627	996.4849	954.2503	897.7957	847.6081	775.1162	724.6337	706.4336	(84)										

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	84.7526	85.0323	85.3082	86.6285	86.8800	88.0706	88.0706	88.2947	87.6082	86.8800	86.3726	85.8484
alpha	6.6502	6.6688	6.6872	6.7752	6.7920	6.8714	6.8714	6.8863	6.8405	6.7920	6.7582	6.7232
util living area	0.9991	0.9977	0.9937	0.9738	0.8978	0.7072	0.5228	0.5769	0.8404	0.9814	0.9976	0.9993 (86)
MIT	20.0191	20.1561	20.3519	20.6338	20.8656	20.9800	20.9977	20.9957	20.9376	20.6503	20.2932	20.0046 (87)
Th 2	20.0047	20.0076	20.0105	20.0241	20.0266	20.0385	20.0385	20.0407	20.0339	20.0266	20.0215	20.0161 (88)
util rest of house	0.9987	0.9967	0.9907	0.9605	0.8505	0.6132	0.4104	0.4601	0.7598	0.9693	0.9962	0.9990 (89)
MIT 2	18.8650	19.0425	19.2941	19.6560	19.9201	20.0291	20.0380	20.0396	19.9970	19.6827	19.2290	18.8553 (90)
Living area fraction										fLA = Living area / (4) =		0.1335 (91)
MIT	19.0191	19.1912	19.4354	19.7866	20.0463	20.1561	20.1662	20.1673	20.1226	19.8120	19.3712	19.0088 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0191	19.1912	19.4354	19.7866	20.0463	20.1561	20.1662	20.1673	20.1226	19.8120	19.3712	19.0088 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9954	0.9882	0.9563	0.8516	0.6253	0.4255	0.4758	0.7682	0.9657	0.9949	0.9986	(94)
Useful gains	734.6047	830.3098	881.3514	923.3232	858.8860	623.0896	406.0537	427.1896	651.1199	748.4977	720.9567	705.4281	(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	1744.4298	1688.1441	1523.0437	1262.2828	964.9409	633.6727	406.7199	428.5697	690.5008	1065.0172	1427.0326	1732.6543	(97)
Space heating kWh	751.3099	576.4646	477.4191	244.0510	78.9048	0.0000	0.0000	0.0000	0.0000	235.4905	508.3747	764.2563	(98a)
Space heating requirement - total per year (kWh/year)												3636.2709	
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	751.3099	576.4646	477.4191	244.0510	78.9048	0.0000	0.0000	0.0000	0.0000	235.4905	508.3747	764.2563	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3636.2709	
Space heating per m2											(98c) / (4) =	33.6069	(99)

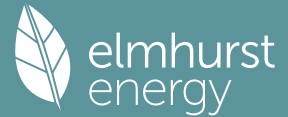
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	751.3099	576.4646	477.4191	244.0510	78.9048	0.0000	0.0000	0.0000	0.0000	235.4905	508.3747	764.2563	(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)	813.9869	624.5554	517.2471	264.4106	85.4874	0.0000	0.0000	0.0000	0.0000	255.1360	550.7851	828.0133	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	249.6842	220.7235	234.4510	206.2518	199.9699	180.2481	178.0207	185.1109	187.1487	208.6010	221.6756	246.9907	(64)
Efficiency of water heater (217)m	86.3702	86.1110	85.6197	84.4381	82.1559	79.8000	79.8000	79.8000	79.8000	84.3324	85.8597	79.8000	(216)
Fuel for water heating, kWh/month	289.0859	256.3243	273.8283	244.2637	243.4029	225.8749	223.0836	231.9685	234.5221	247.3558	258.1836	86.4195	(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	29.8532	23.9493	21.5637	15.7985	12.2032	9.9701	11.1322	14.4700	18.7952	24.6603	27.8537	30.6829	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-49.1223	-68.4931	-97.3614	-108.1819	-115.5320	-107.3792	-105.9956	-100.5840	-90.9076	-77.6670	-53.7121	-42.5541	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-30.0908	-63.0264	-124.7943	-186.7729	-246.3616	-247.3724	-244.5122	-207.3413	-152.3577	-89.9713	-40.1166	-23.8201	(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)													

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

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	3939.6218	1.1300	4451.7726 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3013.6982	1.1300	3405.4790 (278)
Space and water heating			7857.2516 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	240.9325	1.5338	369.5502 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1017.4904	1.4984	-1524.5695
PV Unit electricity exported	-1656.5376	0.4625	-766.1369
Total			-2290.7064 (283)
Total Primary energy kWh/year			6066.1962 (286)
Target Primary Energy Rate (TPER)			56.0600 (287)

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Plot Reference	Plot 41			Issued on Date	17/12/2025
Assessment Reference	Plot 41	Plot Type Ref	Plot 35		
Plot Address				SAP Version	10.2
SAP Rating	87 B	DER	2.90	TER	11.43
Environmental	97 A	% DER < TER			74.63
CO ₂ Emissions (t/year)	0.28	DFEE	38.58	TFEE	42.38
Compliance Check	See BREL	% DFEE < TFEE			8.97
% DPER < TPER	48.80	DPER	30.62	TPER	59.80
Assessor Details	Mr. Andrew Jones			Assessor ID	N955-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	54.1000 (1b)	x 2.4000 (2b)	= 129.8400 (1b) - (3b)
First floor	54.1000 (1c)	x 3.0000 (2c)	= 162.3000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 292.1400 (5)

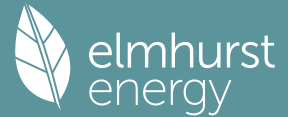
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.0000 (17)
Infiltration rate	0.1000 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1000 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.1275 0.1250 0.1225 0.1100 0.1075 0.0950 0.0950 0.0925 0.1000 0.1075 0.1125 0.1175 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)
Effective ac	0.2090 0.2065 0.2040 0.1915 0.1890 0.1765 0.1765 0.1740 0.1815 0.1890 0.1940 0.1990 (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							
Glazing			18.3500	0.7752	14.2248		(27)
Front Door			2.1900	1.0000	2.1900		(26)
Heatloss Floor 1			54.1000	0.0800	4.3280	75.0000	4057.5000 (28a)
00 External Wall	74.5200	11.6300	62.8900	0.1000	6.2890	190.0000	11949.0994 (29a)
01 External Wall	93.1500	8.9100	84.2400	0.1000	8.4240	190.0000	16005.6003 (29a)
External Roof 1	51.7100		51.7100	0.0900	4.6539	9.0000	465.3900 (30)
Total net area of external elements A _{um} (A, m ²)			273.4800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1097		(33)
Main dwelling							
00 Internal Wall			74.7800			9.0000	673.0200 (32c)
01 Internal Wall			155.9400			9.0000	1403.4600 (32c)
Internal Floor 1			54.1000			18.0000	973.8000 (32d)
00 Internal Ceiling			54.1000			9.0000	486.9000 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 36014.7697 (34)
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ 332.8537 (35)
Thermal bridges (User defined value $0.100 \times \text{total exposed area}$) 27.3480 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.4577 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	20.1489	19.9079	19.6669	18.4618	18.2208	17.0157	17.0157	16.7747	17.4977	18.2208	18.7028	19.1848 (38)
Heat transfer coeff	87.6066	87.3656	87.1246	85.9195	85.6785	84.4734	84.4734	84.2324	84.9554	85.6785	86.1605	86.6425 (39)
Average = $\text{Sum}(39)\text{m} / 12 =$												85.8592
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8097	0.8074	0.8052	0.7941	0.7919	0.7807	0.7807	0.7785	0.7852	0.7919	0.7963	0.8008 (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												2.8036 (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												
82.1565	80.9364	79.2182	76.0501	73.6779	71.0475	69.6267	71.3329	73.1906	76.0052	79.2385	81.8788	(42b)
Hot water usage for other uses												
43.3414	41.7654	40.1893	38.6133	37.0372	35.4612	35.4612	37.0372	38.6133	40.1893	41.7654	43.3414	(42c)
Average daily hot water use (litres/day)												115.5734 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	125.4980	122.7018	119.4075	114.6634	110.7151	106.5087	105.0879	108.3701	111.8039	116.1946	121.0039	125.2203 (44)
Energy conte	198.7581	174.7257	183.5249	156.9685	149.0439	130.9648	127.0947	134.1848	137.8654	157.6749	172.3923	196.0647 (45)
Energy content (annual)												Total = $\text{Sum}(45)\text{m} = 1919.2627$
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
29.8137	26.2089	27.5287	23.5453	22.3566	19.6447	19.0642	20.1277	20.6798	23.6512	25.8588	29.4097	(46)
Water storage loss (or HIU loss):												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7020 (55)
Total storage loss												
21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (56)
If cylinder contains dedicated solar storage												
21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620 (57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
257.8181	228.0702	242.5849	214.1233	208.1038	188.1196	186.1546	193.2448	195.0202	216.7349	229.5471	255.1246	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
257.8181	228.0702	242.5849	214.1233	208.1038	188.1196	186.1546	193.2448	195.0202	216.7349	229.5471	255.1246	(64)
12Total per year (kWh/year)												Total per year (kWh/year) = $\text{Sum}(64)\text{m} = 2614.6461$ (64)
Electric shower(s)												2615 (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) = $\text{Sum}(64a)\text{m} =$												0.0000 (64a)
Heat gains from water heating, kWh/month												
113.3351	100.7719	108.2700	97.9159	96.8051	89.2696	89.5069	91.8644	91.5641	99.6749	103.0443	112.4395	(65)

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

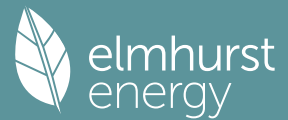
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
139.9670	154.9634	139.9670	144.6325	139.9670	144.6325	139.9670	139.9670	144.6325	139.9670	144.6325	139.9670	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
268.9441	271.7349	264.7022	249.7303	230.8311	213.0685	201.2019	198.4111	205.4439	220.4157	239.3149	257.0776	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	(71)
Water heating gains (Table 5)												
152.3321	149.9582	145.5242	135.9942	130.1143	123.9856	120.3050	123.4737	127.1723	133.9716	143.1171	151.1283	(72)
Total internal gains												
626.2968	641.7102	615.2470	595.4108	565.9661	546.7403	526.5276	526.9055	542.3024	559.4080	592.1182	613.2265	(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				5.0600	10.6334	0.4500	0.8000		0.7700		13.4233 (74)	
East				1.3100	19.6403	0.4500	0.8000		0.7700		6.4188 (76)	
South				9.7100	46.7521	0.4500	0.8000		0.7700		113.2546 (78)	
West				2.2700	19.6403	0.4500	0.8000		0.7700		11.1227 (80)	
Solar gains	144.2193	245.4492	336.3725	419.4729	473.5958	472.1667	454.3631	413.4512	364.9475	271.3130	172.6768	123.4779 (83)
Total gains	770.5161	887.1594	951.6196	1014.8837	1039.5618	1018.9070	980.8907	940.3567	907.2499	830.7210	764.7950	736.7045 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	114.1935	114.5085	114.8253	116.4358	116.7633	118.4290	118.4290	118.7679	117.7571	116.7633	116.1101	115.4641
alpha	8.6129	8.6339	8.6550	8.7624	8.7842	8.8953	8.8953	8.9179	8.8505	8.7842	8.7407	8.6976
util living area	0.9981	0.9930	0.9773	0.9080	0.7478	0.5297	0.3789	0.4120	0.6413	0.9263	0.9927	0.9987 (86)
Living	20.5341	20.6383	20.7575	20.8912	20.9525	20.9644	20.9649	20.9650	20.9621	20.8891	20.6924	20.5178
Non living	19.8197	19.9245	20.0417	20.1710	20.2185	20.2349	20.2350	20.2371	20.2299	20.1733	19.9870	19.8104
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	20.7617	20.6383	20.7575	20.8912	20.9525	20.9644	20.9649	20.9650	20.9621	20.8891	20.6924	20.5853 (87)
Th 2	20.2450	20.2469	20.2488	20.2585	20.2604	20.2701	20.2701	20.2720	20.2662	20.2604	20.2565	20.2527 (88)
util rest of house	0.9973	0.9903	0.9685	0.8791	0.6955	0.4698	0.3161	0.3468	0.5755	0.8961	0.9893	0.9981 (89)
MIT 2	20.0274	19.9245	20.0417	20.1710	20.2185	20.2349	20.2350	20.2371	20.2299	20.1733	19.9870	19.8723 (90)
Living area fraction									fLA = Living area / (4) =			0.1335 (91)
MIT	20.1255	20.0198	20.1373	20.2671	20.3165	20.3323	20.3325	20.3343	20.3277	20.2688	20.0812	19.9675 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1255	20.0198	20.1373	20.2671	20.3165	20.3323	20.3325	20.3343	20.3277	20.2688	20.0812	19.9675 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9892	0.9670	0.8795	0.6996	0.4749	0.3214	0.3524	0.5811	0.8965	0.9883	0.9979 (94)
Useful gains	768.3350	877.5828	920.1962	892.5921	727.2791	483.8863	315.2903	331.3746	527.2036	744.7753	755.8523	735.1227 (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	1386.4146	1320.9506	1188.1431	976.6593	738.2474	484.2262	315.2992	331.3942	529.0776	828.4123	1118.4683	1366.1357 (97)
Space heating kWh	459.8513	297.9431	199.3525	60.5284	8.1604	0.0000	0.0000	0.0000	0.0000	62.2260	261.0836	469.4737 (98a)
Space heating requirement - total per year (kWh/year)												1818.6189
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	459.8513	297.9431	199.3525	60.5284	8.1604	0.0000	0.0000	0.0000	0.0000	62.2260	261.0836	469.4737 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1818.6189
Space heating per m2										(98c) / (4) =		16.8079 (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 %)												274.2219 (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	459.8513	297.9431	199.3525	60.5284	8.1604	0.0000	0.0000	0.0000	0.0000	62.2260	261.0836	469.4737 (98)
Space heating efficiency (main heating system 1)	274.2219	274.2219	274.2219	274.2219	274.2219	0.0000	0.0000	0.0000	0.0000	274.2219	274.2219	274.2219 (210)
Space heating fuel (main heating system)	167.6931	108.6504	72.6975	22.0728	2.9758	0.0000	0.0000	0.0000	0.0000	22.6918	95.2089	171.2021 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	257.8181	228.0702	242.5849	214.1233	208.1038	188.1196	186.1546	193.2448	195.0202	216.7349	229.5471	255.1246 (64)
Efficiency of water heater	284.9893	284.9893	284.9893	284.9893	284.9893	284.9893	284.9893	284.9893	284.9893	284.9893	284.9893	284.9893 (216)
Fuel for water heating, kWh/month	90.4659	80.0276	85.1207	75.1338	73.0216	66.0094	65.3199	67.8077	68.4307	76.0502	80.5459	89.5208 (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	27.9699	25.2632	27.9699	27.0677	27.9699	27.0677	27.9699	27.9699	27.0677	27.9699	27.0677	27.9699 (231)
Lighting	29.7561	23.8714	21.4936	15.7471	12.1635	9.9377	11.0960	14.4230	18.7340	24.5800	27.7631	30.5831 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												663.1924 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												284.9893
Water heating fuel used												917.4542 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)												
mechanical ventilation fans (SFP = 0.9240)												329.3236 (230a)
Total electricity for the above, kWh/year												329.3236 (231)
Electricity for lighting (calculated in Appendix L)												240.1485 (232)

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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	2150.1186 (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	663.1924	0.1580	104.7585 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	917.4542	0.1408	129.1686 (264)
Space and water heating			233.9271 (265)
Pumps, fans and electric keep-hot	329.3236	0.1387	45.6812 (267)
Energy for lighting	240.1485	0.1443	34.6608 (268)
Total CO2, kg/year			314.2692 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9000 (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	663.1924	1.5847	1050.9825 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	917.4542	1.5206	1395.0678 (278)
Space and water heating			2446.0503 (279)
Pumps, fans and electric keep-hot	329.3236	1.5128	498.2007 (281)
Energy for lighting	240.1485	1.5338	368.3477 (282)
Total Primary energy kWh/year			3312.5988 (286)
Dwelling Primary energy Rate (DPER)			30.6200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	54.1000 (1b)	x 2.4000 (2b)	= 129.8400 (1b) - (3b)
First floor	54.1000 (1c)	x 3.0000 (2c)	= 162.3000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	292.1400 (5)

2. Ventilation rate

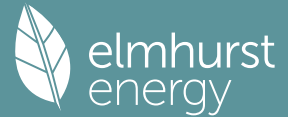
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1369 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3869 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3869 (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	0.4933	0.4837	0.4740	0.4256	0.4159	0.3676	0.3676	0.3579	0.3869	0.4159	0.4353	0.4546 (22b)
Effective ac	0.6217	0.6170	0.6123	0.5906	0.5865	0.5676	0.5676	0.5640	0.5749	0.5865	0.5947	0.6033 (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							

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TER Opaque door			2.1900	1.0000	2.1900	(26)
TER Opening Type			18.3500	1.1450	21.0115	(27)
Heatloss Floor 1			54.1000	0.1300	7.0330	(28a)
00 External Wall	74.5200	11.6300	62.8900	0.1800	11.3202	(29a)
01 External Wall	93.1500	8.9100	84.2400	0.1800	15.1632	(29a)
External Roof 1	51.7100		51.7100	0.1100	5.6881	(30)
Total net area of external elements Aum(A, m2)			273.4800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.4060	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 332.8537 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	14.8400	0.0500	0.7420
E3 Sill	13.7900	0.0500	0.6895
E4 Jamb	32.2000	0.0500	1.6100
E5 Ground floor (normal)	31.0500	0.1600	4.9680
E6 Intermediate floor within a dwelling	31.0500	0.0000	0.0000
E16 Corner (normal)	27.0000	0.0900	2.4300
E17 Corner (inverted - internal area greater than external area)	5.4000	-0.0900	-0.4860

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9535 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 72.3595 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	59.9342	59.4787	59.0322	56.9349	56.5425	54.7159	54.7159	54.3776	55.4195	56.5425	57.3363	58.1662	(38)
Heat transfer coeff	132.2937	131.8381	131.3916	129.2944	128.9020	127.0753	127.0753	126.7371	127.7789	128.9020	129.6958	130.5257	(39)
Average = Sum(39)m / 12 =												129.2925	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2227	1.2185	1.2143	1.1950	1.1913	1.1744	1.1744	1.1713	1.1810	1.1913	1.1987	1.2063	(40)
HLP (average)												1.1949	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8036 (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													
82.1565	80.9364	79.2182	76.0501	73.6779	71.0475	69.6267	71.3329	73.1906	76.0052	79.2385	81.8788	81.8788	(42b)
Hot water usage for other uses													
43.3414	41.7654	40.1893	38.6133	37.0372	35.4612	35.4612	37.0372	38.6133	40.1893	41.7654	43.3414	43.3414	(42c)
Average daily hot water use (litres/day)												115.5734	(43)

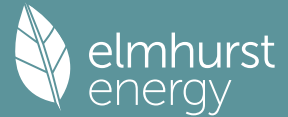
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	125.4980	122.7018	119.4075	114.6634	110.7151	106.5087	105.0879	108.3701	111.8039	116.1946	121.0039	125.2203	(44)
Energy conte	198.7581	174.7257	183.5249	156.9685	149.0439	130.9648	127.0947	134.1848	137.8654	157.6749	172.3923	196.0647	(45)
Energy content (annual)										Total = Sum(45)m =		1919.2627	
Distribution loss (46)m = 0.15 x (45)m													
29.8137	26.2089	27.5287	23.5453	22.3566	19.6447	19.0642	20.1277	20.6798	23.6512	25.8588	29.4097	29.4097	(46)
Water storage loss (or HIU 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	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	27.6637	26.7713	27.6637	26.7713	27.6637	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
249.6842	220.7235	234.4510	206.2518	199.9699	180.2481	178.0207	185.1109	187.1487	208.6010	221.6756	246.9907	246.9907	(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													
249.6842	220.7235	234.4510	206.2518	199.9699	180.2481	178.0207	185.1109	187.1487	208.6010	221.6756	246.9907	246.9907	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2518.8762	(64)
Electric shower(s)												2519	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
106.8279	94.8945	101.7629	91.6187	90.2979	82.9724	82.9998	85.3573	85.2669	93.1678	96.7471	105.9324	105.9324	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	140.1789	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
139.9670	154.9634	139.9670	144.6325	139.9670	144.6325	139.9670	139.9670	139.9670	144.6325	139.9670	144.6325	139.9670	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
268.9441	271.7349	264.7022	249.7303	230.8311	213.0685	201.2019	198.4111	205.4439	220.4157	239.3149	257.0776	257.0776	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	37.0179	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	-112.1431	(71)
Water heating gains (Table 5)													
143.5859	141.2121	136.7781	127.2481	121.3682	115.2395	111.5589	114.7276	118.4262	125.2255	134.3709	142.3822	142.3822	(72)
Total internal gains													
620.5507	635.9641	609.5009	589.6647	560.2199	537.9942	517.7815	518.1594	533.5563	553.6618	586.3721	607.4804	607.4804	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North	5.0600				10.6334		0.6300		0.7000	0.7700	16.4435 (74)	
East	1.3100				19.6403		0.6300		0.7000	0.7700	7.8630 (76)	
South	9.7100				46.7521		0.6300		0.7000	0.7700	138.7369 (78)	
West	2.2700				19.6403		0.6300		0.7000	0.7700	13.6253 (80)	
Solar gains	176.6687	300.6753	412.0563	513.8544	580.1548	578.4042	556.5948	506.4777	447.0607	332.3584	211.5290	151.2605 (83)
Total gains	797.2193	936.6393	1021.5573	1103.5190	1140.3748	1116.3984	1074.3763	1024.6371	980.6170	886.0203	797.9011	758.7409 (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	75.6204	75.8817	76.1396	77.3746	77.6102	78.7258	78.7258	78.9359	78.2923	77.6102	77.1352	76.6447
alpha	6.0414	6.0588	6.0760	6.1583	6.1740	6.2484	6.2484	6.2624	6.2195	6.1740	6.1423	6.1096
util living area	0.9986	0.9961	0.9894	0.9626	0.8812	0.6981	0.5162	0.5617	0.8118	0.9723	0.9963	0.9990 (86)
MIT	19.9021	20.0752	20.3042	20.6083	20.8486	20.9735	20.9964	20.9941	20.9331	20.6261	20.2143	19.8827 (87)
Th 2	19.9019	19.9053	19.9085	19.9240	19.9269	19.9405	19.9405	19.9430	19.9353	19.9269	19.9211	19.9149 (88)
util rest of house	0.9980	0.9943	0.9843	0.9444	0.8275	0.5970	0.3944	0.4368	0.7219	0.9550	0.9943	0.9986 (89)
MIT 2	18.6374	18.8609	19.1538	19.5405	19.8100	19.9283	19.9397	19.9416	19.8974	19.5703	19.0512	18.6224 (90)
Living area fraction	fLA = Living area / (4) =											0.1335 (91)
MIT	18.8063	19.0231	19.3074	19.6831	19.9487	20.0678	20.0808	20.0821	20.0357	19.7113	19.2066	18.7907 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8063	19.0231	19.3074	19.6831	19.9487	20.0678	20.0808	20.0821	20.0357	19.7113	19.2066	18.7907 (93)
8. Space heating requirement												
Utilisation	0.9971	0.9922	0.9805	0.9392	0.8288	0.6098	0.4108	0.4536	0.7314	0.9503	0.9922	0.9978 (94)
Useful gains	794.9050	929.3383	1001.6316	1036.4179	945.0862	680.8214	441.3105	464.8116	717.2392	841.9982	791.7153	757.0884 (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	1919.0968	1861.9583	1682.7880	1394.1966	1063.2699	694.8275	442.3287	466.6628	758.4614	1174.4687	1570.1711	1904.4564 (97)
Space heating kWh	836.3987	626.7206	506.7803	257.6007	87.9287	0.0000	0.0000	0.0000	0.0000	247.3580	560.4882	853.6418 (98a)
Space heating requirement - total per year (kWh/year)												3976.9170
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	836.3987	626.7206	506.7803	257.6007	87.9287	0.0000	0.0000	0.0000	0.0000	247.3580	560.4882	853.6418 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3976.9170
Space heating per m2	(98c) / (4) =											36.7552 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	836.3987	626.7206	506.7803	257.6007	87.9287	0.0000	0.0000	0.0000	0.0000	247.3580	560.4882	853.6418 (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)	906.1741	679.0039	549.0578	279.0907	95.2640	0.0000	0.0000	0.0000	0.0000	267.9935	607.2462	924.8557 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	249.6842	220.7235	234.4510	206.2518	199.9699	180.2481	178.0207	185.1109	187.1487	208.6010	221.6756	246.9907 (64)
Efficiency of water heater	86.5558	86.2659	85.7414	84.5595	82.3491	79.8000	79.8000	79.8000	79.8000	84.4429	86.0495	79.8000 (216)
Fuel for water heating, kWh/month	288.4662	255.8640	273.4398	243.9133	242.8321	225.8749	223.0836	231.9685	234.5221	247.0319	257.6140	285.1823 (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	29.0824	23.3310	21.0069	15.3906	11.8881	9.7127	10.8448	14.0964	18.3099	24.0235	27.1345	29.8907 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-49.0962	-68.4489	-97.2943	-108.1087	-115.4597	-107.3152	-105.9240	-100.5015	-90.8236	-77.6011	-53.6765	-42.5317 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-30.1169	-63.0706	-124.8614	-186.8461	-246.4338	-247.4365	-244.5838	-207.4239	-152.4417	-90.0373	-40.1522	-23.8425 (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												

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Space heating fuel - main system 1	4308.6858	(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	3009.7927	(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)	234.7114	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2674.0280	(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	4965.1619	(238)

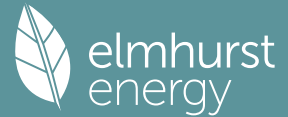
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4308.6858	0.2100	904.8240 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3009.7927	0.2100	632.0565 (264)
Space and water heating			1536.8805 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	234.7114	0.1443	33.8761 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1016.7814	0.1348	-137.1044
PV Unit electricity exported	-1657.2466	0.1260	-208.8113
Total			-345.9157 (269)
Total CO2, kg/year			1236.7702 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4300 (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	4308.6858	1.1300	4868.8149 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3009.7927	1.1300	3401.0657 (278)
Space and water heating			8269.8807 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	234.7114	1.5338	360.0082 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1016.7814	1.4984	-1523.5105
PV Unit electricity exported	-1657.2466	0.4625	-766.4881
Total			-2289.9986 (283)
Total Primary energy kWh/year			6469.9911 (286)
Target Primary Energy Rate (TPER)			59.8000 (287)

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Plot Reference	Plot 46				Issued on Date	17/12/2025	
Assessment Reference	Plot 46			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	88 B	DER	2.67	TER	9.08		
Environmental	98 A	% DER < TER				70.59	
CO ₂ Emissions (t/year)	0.26	DFEE	29.03	TFEE	31.24		
Compliance Check	See BREL	% DFEE < TFEE				7.10	
% DPER < TPER	39.70	DPER	28.46	TPER	47.19		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
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	53.4000 (1b)	x 2.4000 (2b)	= 128.1600 (1b) - (3b)
First floor	52.9100 (1c)	x 3.0000 (2c)	= 158.7300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.8900 (5)

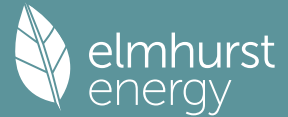
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.0000 (17)
Infiltration rate	0.1000 (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) = 0.0850 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.1084 0.1063 0.1041 0.0935 0.0914 0.0808 0.0808 0.0786 0.0850 0.0914 0.0956 0.0999 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	83.7000 (23c)
Effective ac	0.1899 0.1877 0.1856 0.1750 0.1729 0.1622 0.1622 0.1601 0.1665 0.1729 0.1771 0.1814 (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							
Glazing			14.1900	0.7752	11.0000		(27)
Front Door			2.2100	1.0000	2.2100		(26)
Ground			53.4000	0.0800	4.2720	75.0000	4005.0000 (28a)
00 Ext Wall	30.2600	11.3500	18.9100	0.1000	1.8910	190.0000	3592.9000 (29a)
01 Ext Wall	32.6400	5.0500	27.5900	0.1000	2.7590	190.0000	5242.0999 (29a)
External Roof 1	53.4000		53.4000	0.0900	4.8060	9.0000	480.6000 (30)
Total net area of external elements Aum(A, m ²)			169.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.9380		(33)
Main dwelling							
Ground			46.4100	0.0000	0.0000	180.0000	8353.8000 (32)
First			58.0200	0.0000	0.0000	180.0000	10443.6001 (32)
Ground			31.9400			9.0000	287.4600 (32c)
First			47.6200			9.0000	428.5800 (32c)
First			52.9100			18.0000	952.3800 (32d)

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Ground	53.4000					9.0000					480.6000 (32e)		
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =						34267.0200 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												322.3311 (35)	
Thermal bridges (User defined value 0.100 * total exposed area)												16.9700 (36)	
Point Thermal bridges						(36a) =						0.0000	
Total fabric heat loss						(33) + (36) + (36a) =						43.9080 (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	(38)
Heat transfer coeff	17.9762	17.7750	17.5738	16.5679	16.3667	15.3608	15.3608	15.1596	15.7632	16.3667	16.7691	17.1714	(38)
Average = Sum(39)m / 12 =	61.8842	61.6830	61.4818	60.4759	60.2747	59.2688	59.2688	59.0676	59.6712	60.2747	60.6771	61.0794	(39)
												60.4256	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	0.5821	0.5802	0.5783	0.5689	0.5670	0.5575	0.5575	0.5556	0.5613	0.5670	0.5708	0.5745	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.5684	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.7908 (42)	
Hot water usage for mixer showers											0.0000 (42a)	
Hot water usage for baths											86.2188 (42b)	
Hot water usage for other uses											45.4845 (42c)	
Average daily hot water use (litres/day)											121.2879 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.7032	128.7688	125.3116	120.3329	116.1894	111.7750	110.2839	113.7284	117.3320	121.9398	126.9870	131.4118 (44)
Energy content (annual)	208.5857	183.3650	192.5993	164.7298	156.4133	137.4404	133.3788	140.8196	144.6821	165.4712	180.9162	205.7590 (45)
Distribution loss (46)m = 0.15 x (45)m											Total = Sum(45)m = 2014.1605	
Water storage loss (or HIU loss):	31.2879	27.5048	28.8899	24.7095	23.4620	20.6161	20.0068	21.1229	21.7023	24.8207	27.1374	30.8639 (46)
Store volume											200.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):											1.3000 (48)	
Temperature factor from Table 2b											0.7800 (49)	
Enter (49) or (54) in (55)											1.0140 (55)	
Total storage loss	31.4340	28.3920	31.4340	30.4200	31.4340	30.4200	31.4340	31.4340	30.4200	31.4340	30.4200	31.4340 (56)
If cylinder contains dedicated solar storage	31.4340	28.3920	31.4340	30.4200	31.4340	30.4200	31.4340	31.4340	30.4200	31.4340	30.4200	31.4340 (57)
Primary loss	106.3213	96.0322	106.3213	102.8916	106.3213	36.0948	37.2980	37.2980	36.0948	106.3213	102.8916	106.3213 (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	346.3410	307.7892	330.3546	298.0414	294.1686	203.9552	202.1108	209.5515	211.1969	303.2265	314.2278	343.5144 (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	346.3410	307.7892	330.3546	298.0414	294.1686	203.9552	202.1108	209.5515	211.1969	303.2265	314.2278	343.5144 (64)
12Total per year (kWh/year)											Total per year (kWh/year) = Sum(64)m = 3364.4779 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	154.4118	137.7946	149.0963	137.0859	137.0645	74.5748	74.1868	76.6609	76.9826	140.0762	142.4679	153.4719 (65)

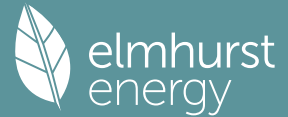
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.5278	161.1201	145.5278	150.3787	145.5278	150.3787	145.5278	145.5278	150.3787	145.5278	150.3787	145.5278 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.1439	268.9057	261.9462	247.1302	228.4278	210.8501	199.1071	196.3453	203.3048	218.1208	236.8233	254.4010 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538 (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)	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307 (71)
Water heating gains (Table 5)	207.5428	205.0515	200.3983	190.3971	184.2265	103.5761	99.7135	103.0388	106.9203	188.2745	197.8721	206.2795 (72)
Total internal gains	684.0760	699.9387	672.7338	652.7676	623.0435	529.6664	509.2099	509.7735	525.4654	616.7846	649.9356	671.0697 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				0.8400	10.6334	0.4500	0.8000		0.7700		2.2284 (74)	
East				8.2200	19.6403	0.4500	0.8000		0.7700		40.2768 (76)	
South				0.8400	46.7521	0.4500	0.8000		0.7700		9.7975 (78)	
West				4.2900	19.6403	0.4500	0.8000		0.7700		21.0204 (80)	
Solar gains	73.3230	140.2146	225.1509	322.7301	392.6922	401.2479	382.2754	329.8807	259.7235	164.6597	90.7927	60.7314 (83)
Total gains	757.3990	840.1533	897.8846	975.4976	1015.7357	930.9143	891.4852	839.6542	785.1889	781.4443	740.7283	731.8012 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	153.8134	154.3151	154.8201	157.3952	157.9206	160.6008	160.6008	161.1478	159.5178	157.9206	156.8733	155.8399
alpha	11.2542	11.2877	11.3213	11.4930	11.5280	11.7067	11.7067	11.7432	11.6345	11.5280	11.4582	11.3893
util living area	0.9917	0.9733	0.9155	0.7431	0.5516	0.4075	0.2925	0.3236	0.5242	0.7888	0.9657	0.9938 (86)
Living	20.7825	20.8544	20.9257	20.9682	20.9727	20.9733	20.9733	20.9734	20.9731	20.9659	20.8865	20.7715
Non living	20.2503	20.3207	20.3863	20.4280	20.4327	20.4417	20.4417	20.4435	20.4381	20.4285	20.3595	20.2459
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	20.8888	20.8544	20.9257	20.9682	20.9727	20.9733	20.9733	20.9734	20.9731	20.9659	20.8865	20.8035 (87)
Th 2	20.4461	20.4478	20.4495	20.4581	20.4598	20.4684	20.4684	20.4701	20.4650	20.4598	20.4564	20.4530 (88)
util rest of house	0.9889	0.9654	0.8962	0.7121	0.5197	0.3736	0.2572	0.2863	0.4837	0.7525	0.9545	0.9917 (89)
MIT 2	20.3459	20.3207	20.3863	20.4280	20.4327	20.4417	20.4417	20.4435	20.4381	20.4285	20.3595	20.2749 (90)
Living area fraction									fLA = Living area / (4) =			0.1893 (91)
MIT	20.4487	20.4217	20.4884	20.5302	20.5349	20.5423	20.5423	20.5438	20.5394	20.5302	20.4593	20.3749 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4487	20.4217	20.4884	20.5302	20.5349	20.5423	20.5423	20.5438	20.5394	20.5302	20.4593	20.3749 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9889	0.9649	0.8976	0.7162	0.5241	0.3783	0.2621	0.2915	0.4893	0.7573	0.9545	0.9913 (94)
Useful gains	749.0198	810.6925	805.9679	698.6993	532.3712	352.1929	233.6579	244.7653	384.1960	591.8260	707.0398	725.4288 (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	999.3467	957.4258	860.0339	703.3494	532.5194	352.1954	233.6579	244.7654	384.2441	598.5416	810.6003	987.9538 (97)
Space heating kWh	186.2432	98.6048	40.2251	3.3481	0.1103	0.0000	0.0000	0.0000	0.0000	4.9964	74.5636	195.3186 (98a)
Space heating requirement - total per year (kWh/year)												603.4101
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	186.2432	98.6048	40.2251	3.3481	0.1103	0.0000	0.0000	0.0000	0.0000	4.9964	74.5636	195.3186 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												603.4101
Space heating per m2										(98c) / (4) =		5.6759 (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 %)												269.6022 (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	186.2432	98.6048	40.2251	3.3481	0.1103	0.0000	0.0000	0.0000	0.0000	4.9964	74.5636	195.3186 (98)
Space heating efficiency (main heating system 1)	269.6022	269.6022	269.6022	269.6022	269.6022	0.0000	0.0000	0.0000	0.0000	269.6022	269.6022	269.6022 (210)
Space heating fuel (main heating system)	69.0807	36.5742	14.9202	1.2419	0.0409	0.0000	0.0000	0.0000	0.0000	1.8533	27.6569	72.4470 (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	346.3410	307.7892	330.3546	298.0414	294.1686	203.9552	202.1108	209.5515	211.1969	303.2265	314.2278	343.5144 (64)
Efficiency of water heater	285.7881	285.7881	285.7881	285.7881	285.7881	285.7881	285.7881	285.7881	285.7881	285.7881	285.7881	285.7881 (216)
Fuel for water heating, kWh/month	121.1880	107.6984	115.5942	104.2875	102.9324	71.3659	70.7205	73.3241	73.8998	106.1018	109.9513	120.1990 (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	27.4673	24.8092	27.4673	26.5813	27.4673	26.5813	27.4673	27.4673	26.5813	27.4673	26.5813	27.4673 (231)
Lighting	30.9383	24.8198	22.3475	16.3727	12.6468	10.3325	11.5368	14.9960	19.4783	25.5566	28.8661	31.7981 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												223.8150 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.7881
Water heating fuel used												1177.2630 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)												
mechanical ventilation fans (SFP = 0.9240)												323.4054 (230a)

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Total electricity for the above, kWh/year	323.4054	(231)
Electricity for lighting (calculated in Appendix L)	249.6894	(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	1974.1728	(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	223.8150	0.1600	35.8149 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1177.2630	0.1422	167.4384 (264)
Space and water heating			203.2533 (265)
Pumps, fans and electric keep-hot	323.4054	0.1387	44.8603 (267)
Energy for lighting	249.6894	0.1443	36.0379 (268)
Total CO2, kg/year			284.1515 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.6700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	223.8150	1.5922	356.3674 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1177.2630	1.5260	1796.5013 (278)
Space and water heating			2152.8687 (279)
Pumps, fans and electric keep-hot	323.4054	1.5128	489.2476 (281)
Energy for lighting	249.6894	1.5338	382.9820 (282)
Total Primary energy kWh/year			3025.0983 (286)
Dwelling Primary energy Rate (DPER)			28.4600 (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	53.4000 (1b)	x 2.4000 (2b)	= 128.1600 (1b) - (3b)
First floor	52.9100 (1c)	x 3.0000 (2c)	= 158.7300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	286.8900 (5)

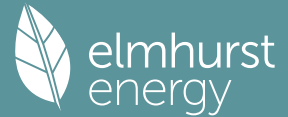
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1394 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3894 (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) = 0.3310 (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	0.4220	0.4138	0.4055	0.3641	0.3558	0.3145	0.3145	0.3062	0.3310	0.3558	0.3724	0.3889 (22b)
Effective ac	0.5891	0.5856	0.5822	0.5663	0.5633	0.5494	0.5494	0.5469	0.5548	0.5633	0.5693	0.5756 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2		Openings m2		NetArea m2		U-value W/m2K		A x U W/K		K-value kJ/m2K		A x K kJ/K	
Main dwelling														
TER Opaque door					2.2100		1.0000		2.2100				(26)	
TER Opening Type					14.1900		1.1450		16.2481				(27)	
Ground					53.4000		0.1300		6.9420				(28a)	
00 Ext Wall	30.2600		11.3500		18.9100		0.1800		3.4038				(29a)	
01 Ext Wall	32.6400		5.0500		27.5900		0.1800		4.9662				(29a)	
External Roof 1	53.4000				53.4000		0.1100		5.8740				(30)	
Total net area of external elements Aum(A, m2)					169.7000								(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =				39.6441				(33)	
Main dwelling														
Ground					46.4100		0.0000		0.0000				(32)	
First					58.0200		0.0000		0.0000				(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													322.3311 (35)	
List of Thermal Bridges														
K1 Element							Length		Psi-value		Total			
E1 Steel lintel with perforated steel base plate							11.0500		0.0500		0.5525			
E3 Sill							10.0000		0.0500		0.5000			
E4 Jamb							29.5000		0.0500		1.4750			
E5 Ground floor (normal)							12.6100		0.1600		2.0176			
E6 Intermediate floor within a dwelling							10.8800		0.0000		0.0000			
E18 Party wall between dwellings							21.6000		0.0600		1.2960			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													5.8411 (36)	
Point Thermal bridges											(36a) =		0.0000	
Total fabric heat loss									(33) + (36) + (36a) =				45.4852 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)														
(38)m	Jan 55.7684	Feb 55.4410	Mar 55.1201	Apr 53.6127	May 53.3307	Jun 52.0178	Jul 52.0178	Aug 51.7747	Sep 52.5235	Oct 53.3307	Nov 53.9012	Dec 54.4977	(38)	
Heat transfer coeff	101.2536	100.9262	100.6053	99.0979	98.8159	97.5030	97.5030	97.2599	98.0087	98.8159	99.3864	99.9829	(39)	
Average = Sum(39)m / 12 =													99.0965	
HLP	Jan 0.9524	Feb 0.9494	Mar 0.9463	Apr 0.9322	May 0.9295	Jun 0.9172	Jul 0.9172	Aug 0.9149	Sep 0.9219	Oct 0.9295	Nov 0.9349	Dec 0.9405	(40)	
HLP (average)													0.9321	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31		

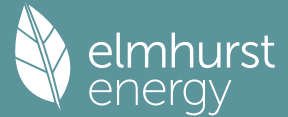
4. Water heating energy requirements (kWh/year)														

Assumed occupancy													2.7908 (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														
81.9078	80.6914	78.9784	75.8199	73.4548	70.8324	69.4159	71.1169	72.9690	75.7751	78.9987	81.6309	81.6309	(42b)	
Hot water usage for other uses														
43.2102	41.6390	40.0677	38.4964	36.9251	35.3538	35.3538	36.9251	38.4964	40.0677	41.6390	43.2102	43.2102	(42c)	
Average daily hot water use (litres/day)													115.2235 (43)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Daily hot water use	125.1181	122.3303	119.0460	114.3163	110.3800	106.1862	104.7697	108.0420	111.4654	115.8428	120.6376	124.8412	(44)	
Energy conte	198.1564	174.1968	182.9693	156.4933	148.5926	130.5684	126.7099	133.7786	137.4480	157.1976	171.8704	195.4711	(45)	
Energy content (annual)														
Distribution loss (46)m = 0.15 x (45)m													1913.4524	
29.7235	26.1295	27.4454	23.4740	22.2889	19.5853	19.0065	20.0668	20.6172	23.5796	25.7806	29.3207	29.3207	(46)	
Water storage loss (or HIU 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	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	27.6637	26.7713	27.6637	26.7713	27.6637	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														
249.0825	220.1945	233.8954	205.7766	199.5187	179.8517	177.6360	184.7047	186.7313	208.1237	221.1537	246.3972	246.3972	(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	249.0825	220.1945	233.8954	205.7766	199.5187	179.8517	177.6360	184.7047	186.7313	208.1237	221.1537	246.3972	(64)	
12Total per year (kWh/year)													2513.0659 (64)	
Electric shower(s)													2513 (64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)	
Heat gains from water heating, kWh/month														
106.6279	94.7186	101.5782	91.4607	90.1479	82.8406	82.8719	85.2222	85.1281	93.0091	96.5735	105.7350	105.7350	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	Jan 139.5383	Feb 139.5383	Mar 139.5383	Apr 139.5383	May 139.5383	Jun 139.5383	Jul 139.5383	Aug 139.5383	Sep 139.5383	Oct 139.5383	Nov 139.5383	Dec 139.5383	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
145.5278	161.1201	145.5278	150.3787	145.5278	150.3787	145.5278	145.5278	145.5278	150.3787	145.5278	150.3787	145.5278	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
266.1439	268.9057	261.9462	247.1302	228.4278	210.8501	199.1071	196.3453	203.3048	218.1208	236.8233	254.4010	254.4010	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	(69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)														
-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	(71)	
Water heating gains (Table 5)														
143.3170	140.9503	136.5298	127.0287	121.1666	115.0564	111.3870	114.5460	118.2335	125.0122	134.1299	142.1169	142.1169	(72)	
Total internal gains	622.8503	638.8376	611.8653	592.3991	562.9836	541.1467	520.8833	521.2807	536.7785	556.5223	589.1934	609.9072	(73)	

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	0.8400		10.6334		0.6300		0.7000		0.7700		2.7298 (74)	
East	8.2200		19.6403		0.6300		0.7000		0.7700		49.3391 (76)	
South	0.8400		46.7521		0.6300		0.7000		0.7700		12.0020 (78)	
West	4.2900		19.6403		0.6300		0.7000		0.7700		25.7500 (80)	
Solar gains	89.8207	171.7629	275.8098	395.3443	481.0479	491.5287	468.2873	404.1039	318.1613	201.7082	111.2211	74.3960 (83)
Total gains	712.6710	810.6004	887.6751	987.7434	1044.0315	1032.6754	989.1707	925.3845	854.9399	758.2304	700.4145	684.3032 (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	94.0077	94.3126	94.6135	96.0527	96.3268	97.6238	97.6238	97.8679	97.1201	96.3268	95.7738	95.2025
alpha	7.2672	7.2875	7.3076	7.4035	7.4218	7.5083	7.5083	7.5245	7.4747	7.4218	7.3849	7.3468
util living area	0.9989	0.9968	0.9894	0.9478	0.8181	0.5988	0.4332	0.4824	0.7578	0.9703	0.9967	0.9992 (86)
MIT	20.1723	20.3091	20.5088	20.7771	20.9450	20.9952	20.9996	20.9992	20.9759	20.7523	20.4207	20.1565 (87)
Th 2	20.1232	20.1257	20.1283	20.1403	20.1425	20.1529	20.1529	20.1549	20.1489	20.1425	20.1380	20.1332 (88)
util rest of house	0.9985	0.9955	0.9849	0.9268	0.7633	0.5223	0.3501	0.3944	0.6790	0.9538	0.9951	0.9989 (89)
MIT 2	19.1570	19.3338	19.5888	19.9243	20.1018	20.1507	20.1528	20.1547	20.1355	19.9033	19.4866	19.1448 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.3492	19.5184	19.7629	20.0857	20.2614	20.3105	20.3131	20.3145	20.2945	20.0639	19.6634	19.3362 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3492	19.5184	19.7629	20.0857	20.2614	20.3105	20.3131	20.3145	20.2945	20.0639	19.6634	19.3362 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9979	0.9942	0.9824	0.9253	0.7714	0.5368	0.3659	0.4111	0.6933	0.9519	0.9938	0.9984 (94)
Useful gains	711.1524	805.9212	872.0284	913.9262	805.4086	554.2989	361.9176	380.4419	592.7022	721.7493	696.0784	683.2015 (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	1523.7854	1475.3754	1334.3224	1108.4827	846.0008	556.7950	362.0388	380.7226	607.1176	935.1879	1248.6306	1513.3635 (97)
Space heating kWh	604.5989	449.8732	343.9468	140.0807	30.2006	0.0000	0.0000	0.0000	0.0000	158.7983	397.8375	617.6405 (98a)
Space heating requirement - total per year (kWh/year)	2742.9765											
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	604.5989	449.8732	343.9468	140.0807	30.2006	0.0000	0.0000	0.0000	0.0000	158.7983	397.8375	617.6405 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2742.9765											
Space heating per m2	(98c) / (4) = 25.8017 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	604.5989	449.8732	343.9468	140.0807	30.2006	0.0000	0.0000	0.0000	0.0000	158.7983	397.8375	617.6405 (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)	655.0367	487.4033	372.6400	151.7667	32.7200	0.0000	0.0000	0.0000	0.0000	172.0458	431.0266	669.1663 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	249.0825	220.1945	233.8954	205.7766	199.5187	179.8517	177.6360	184.7047	186.7313	208.1237	221.1537	246.3972 (64)
Efficiency of water heater (217)m	85.9710	85.6265	84.9232	83.2160	80.8776	79.8000	79.8000	79.8000	79.8000	83.4609	85.3604	79.8000 (216)
Fuel for water heating, kWh/month	289.7287	257.1569	275.4201	247.2801	246.6921	225.3780	222.6015	231.4595	233.9991	249.3668	259.0823	286.3984 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	30.2378	24.2579	21.8415	16.0020	12.3604	10.0986	11.2756	14.6565	19.0373	24.9780	28.2125	31.0782 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-48.5484	-67.7194	-96.2938	-107.0289	-114.3263	-106.2698	-104.9108	-99.5540	-89.9617	-76.8228	-53.0989	-42.0547 (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	-29.6397	-62.0984	-122.9875	-184.1095	-242.8847	-243.8918	-241.0618	-204.3871	-150.1560	-88.6466	-39.5157	-23.4607 (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)												

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(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												2971.8055	(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												3024.5633	(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)												244.0364	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2639.4289	(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												3686.9763	(238)

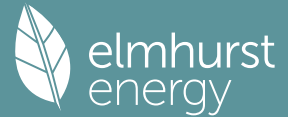
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2971.8055	0.2100	624.0792 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3024.5633	0.2100	635.1583 (264)
Space and water heating			1259.2374 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	244.0364	0.1443	35.2220 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1006.5895	0.1348	-135.7213
PV Unit electricity exported	-1632.8394	0.1260	-205.7203
Total			-341.4415 (269)
Total CO2, kg/year			964.9472 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.0800 (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	2971.8055	1.1300	3358.1402 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3024.5633	1.1300	3417.7565 (278)
Space and water heating			6775.8967 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	244.0364	1.5338	374.3111 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1006.5895	1.4983	-1508.2063
PV Unit electricity exported	-1632.8394	0.4625	-755.1411
Total			-2263.3474 (283)
Total Primary energy kWh/year			5016.9613 (286)
Target Primary Energy Rate (TPER)			47.1900 (287)

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Plot Reference	Plot 47				Issued on Date	17/12/2025	
Assessment Reference	Plot 47			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	87 B	DER	2.94	TER	10.45		
Environmental	97 A	% DER < TER				71.87	
CO ₂ Emissions (t/year)	0.29	DFEE	34.45	TFEE	37.55		
Compliance Check	See BREL	% DFEE < TFEE				8.25	
% DPER < TPER	42.90	DPER	31.15	TPER	54.55		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
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	53.4000 (1b)	x 2.4000 (2b)	= 128.1600 (1b) - (3b)
First floor	52.9100 (1c)	x 3.0000 (2c)	= 158.7300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 286.8900 (5)

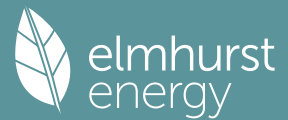
2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	0.0000 / (5) =	0.0000 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate		2.0000 (17)
Number of sides sheltered		0.1000 (18)
		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0925 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)	
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)	
Adj infilt rate	0.1179 0.1156 0.1133 0.1018 0.0994 0.0879 0.0879 0.0856 0.0925 0.0994 0.1041 0.1087 (22b)	
Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		
Effective ac	0.1994 0.1971 0.1948 0.1832 0.1809 0.1694 0.1694 0.1671 0.1740 0.1809 0.1856 0.1902 (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							
Glazing			15.4500	0.7752	11.9767		(27)
Front Door			2.2100	1.0000	2.2100		(26)
Ground			53.4000	0.0800	4.2720	75.0000	4005.0000 (28a)
00 Ext Wall	51.8600	11.8300	40.0300	0.1000	4.0030	190.0000	7605.7001 (29a)
01 Ext Wall	61.4700	5.8300	55.6400	0.1000	5.5640	190.0000	10571.6002 (29a)
External Roof 1	53.4000		53.4000	0.0900	4.8060	9.0000	480.6000 (30)
Total net area of external elements Aum(A, m ²)			220.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8317		(33)
Main dwelling							
Ground			23.2000	0.0000	0.0000	180.0000	4176.0001 (32)
First			29.0100	0.0000	0.0000	180.0000	5221.8000 (32)
Ground			31.9400			9.0000	287.4600 (32c)
First			47.6200			9.0000	428.5800 (32c)
First			52.9100			18.0000	952.3800 (32d)

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Ground	53.4000							9.0000			480.6000 (32e)	
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) =			34209.7205 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											321.7921 (35)	
Thermal bridges (User defined value 0.100 * total exposed area)											22.0130 (36)	
Point Thermal bridges											(36a) = 0.0000	
Total fabric heat loss								(33) + (36) + (36a) =			54.8447 (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
	18.8815	18.6626	18.4436	17.3490	17.1300	16.0354	16.0354	15.8164	16.4732	17.1300	17.5679	18.0058 (38)
Heat transfer coeff	73.7262	73.5073	73.2884	72.1937	71.9748	70.8801	70.8801	70.6612	71.3180	71.9748	72.4126	72.8505 (39)
Average = Sum(39)m / 12 =												72.1390
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.6935	0.6914	0.6894	0.6791	0.6770	0.6667	0.6667	0.6647	0.6708	0.6770	0.6811	0.6853 (40)
HLP (average)												0.6786
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7908 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	86.2188	84.9383	83.1351	79.8104	77.3209	74.5604	73.0694	74.8599	76.8095	79.7633	83.1565	85.9273 (42b)
Hot water usage for other uses	45.4845	43.8305	42.1765	40.5225	38.8685	37.2146	37.2146	38.8685	40.5225	42.1765	43.8305	45.4845 (42c)
Average daily hot water use (litres/day)												121.2879 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.7032	128.7688	125.3116	120.3329	116.1894	111.7750	110.2839	113.7284	117.3320	121.9398	126.9870	131.4118 (44)
Energy content (annual)	208.5857	183.3650	192.5993	164.7298	156.4133	137.4404	133.3788	140.8196	144.6821	165.4712	180.9162	205.7590 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2014.1605
Water storage loss (or HIU loss):	31.2879	27.5048	28.8899	24.7095	23.4620	20.6161	20.0068	21.1229	21.7023	24.8207	27.1374	30.8639 (46)
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.0140 (55)
Total storage loss	31.4340	28.3920	31.4340	30.4200	31.4340	30.4200	31.4340	31.4340	30.4200	31.4340	30.4200	31.4340 (56)
If cylinder contains dedicated solar storage	31.4340	28.3920	31.4340	30.4200	31.4340	30.4200	31.4340	31.4340	30.4200	31.4340	30.4200	31.4340 (57)
Primary loss	106.3213	96.0322	106.3213	102.8916	106.3213	36.0948	37.2980	37.2980	36.0948	106.3213	102.8916	106.3213 (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	346.3410	307.7892	330.3546	298.0414	294.1686	203.9552	202.1108	209.5515	211.1969	303.2265	314.2278	343.5144 (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	346.3410	307.7892	330.3546	298.0414	294.1686	203.9552	202.1108	209.5515	211.1969	303.2265	314.2278	343.5144 (64)
12Total per year (kWh/year)												3364.4779 (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	154.4118	137.7946	149.0963	137.0859	137.0645	74.5748	74.1868	76.6609	76.9826	140.0762	142.4679	153.4719 (65)

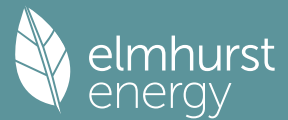
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.8573	158.1635	142.8573	147.6193	142.8573	147.6193	142.8573	142.8573	147.6193	142.8573	147.6193	142.8573 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.1439	268.9057	261.9462	247.1302	228.4278	210.8501	199.1071	196.3453	203.3048	218.1208	236.8233	254.4010 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538 (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)	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307 (71)
Water heating gains (Table 5)	207.5428	205.0515	200.3983	190.3971	184.2265	103.5761	99.7135	103.0388	106.9203	188.2745	197.8721	206.2795 (72)
Total internal gains	681.4055	696.9821	670.0633	650.0081	620.3730	526.9069	506.5394	507.1030	522.7059	614.1141	647.1761	668.3993 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North				0.6500	10.6334		0.4500	0.8000	0.7700	1.7243 (74)		
East				8.2200	19.6403		0.4500	0.8000	0.7700	40.2768 (76)		
South				2.2900	46.7521		0.4500	0.8000	0.7700	26.7099 (78)		
West				4.2900	19.6403		0.4500	0.8000	0.7700	21.0204 (80)		
Solar gains	89.7314	166.9494	258.7966	359.9778	430.7047	437.4467	417.8085	365.0175	294.6123	193.3881	110.2179	74.9251 (83)
Total gains	771.1369	863.9316	928.8599	1009.9859	1051.0778	964.3536	924.3479	872.1205	817.3182	807.5023	757.3940	743.3244 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	128.8917	129.2756	129.6618	131.6278	132.0282	134.0672	134.0672	134.4826	133.2441	132.0282	131.2299	130.4411
alpha	9.5928	9.6184	9.6441	9.7752	9.8019	9.9378	9.9378	9.9655	9.8829	9.8019	9.7487	9.6961
util living area	0.9958	0.9864	0.9548	0.8291	0.6340	0.4703	0.3374	0.3727	0.6005	0.8694	0.9838	0.9969 (86)
Living	20.6612	20.7485	20.8514	20.9442	20.9662	20.9685	20.9686	20.9687	20.9676	20.9374	20.7948	20.6482
Non living	20.0388	20.1259	20.2246	20.3115	20.3284	20.3389	20.3389	20.3409	20.3348	20.3095	20.1799	20.0326
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	20.8267	20.7485	20.8514	20.9442	20.9662	20.9685	20.9686	20.9687	20.9676	20.9374	20.7948	20.6974 (87)
Th 2	20.3466	20.3484	20.3502	20.3593	20.3612	20.3703	20.3703	20.3721	20.3667	20.3612	20.3575	20.3539 (88)
util rest of house	0.9942	0.9818	0.9410	0.7953	0.5916	0.4241	0.2891	0.3218	0.5462	0.8329	0.9773	0.9957 (89)
MIT 2	20.1891	20.1259	20.2246	20.3115	20.3284	20.3389	20.3389	20.3409	20.3348	20.3095	20.1799	20.0776 (90)
Living area fraction									FLA = Living area / (4) =			0.1893 (91)
MIT	20.3098	20.2437	20.3432	20.4312	20.4491	20.4581	20.4581	20.4597	20.4545	20.4283	20.2963	20.1949 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3098	20.2437	20.3432	20.4312	20.4491	20.4581	20.4581	20.4597	20.4545	20.4283	20.2963	20.1949 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9941	0.9809	0.9408	0.7992	0.5975	0.4305	0.2958	0.3289	0.5538	0.8370	0.9766	0.9953 (94)
Useful gains	766.5829	847.3935	873.8622	807.2165	628.0418	415.1660	273.4622	286.8588	452.5967	675.8865	739.6393	739.8527 (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	1180.3410	1127.8772	1014.5466	832.4821	629.7131	415.2206	273.4633	286.8618	453.1920	707.3907	955.5788	1165.2337 (97)
Space heating kWh	307.8361	188.4850	104.6691	18.1912	1.2434	0.0000	0.0000	0.0000	0.0000	23.4391	155.4764	316.4834 (98a)
Space heating requirement - total per year (kWh/year)												1115.8238
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	307.8361	188.4850	104.6691	18.1912	1.2434	0.0000	0.0000	0.0000	0.0000	23.4391	155.4764	316.4834 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1115.8238
Space heating per m2										(98c) / (4) =		10.4959 (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 %)												272.8627 (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	307.8361	188.4850	104.6691	18.1912	1.2434	0.0000	0.0000	0.0000	0.0000	23.4391	155.4764	316.4834 (98)
Space heating efficiency (main heating system 1)	272.8627	272.8627	272.8627	272.8627	272.8627	0.0000	0.0000	0.0000	0.0000	272.8627	272.8627	272.8627 (210)
Space heating fuel (main heating system)	112.8172	69.0769	38.3596	6.6668	0.4557	0.0000	0.0000	0.0000	0.0000	8.5901	56.9797	115.9863 (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	346.3410	307.7892	330.3546	298.0414	294.1686	203.9552	202.1108	209.5515	211.1969	303.2265	314.2278	343.5144 (64)
Efficiency of water heater	285.7807	285.7807	285.7807	285.7807	285.7807	285.7807	285.7807	285.7807	285.7807	285.7807	285.7807	285.7807 (216)
Fuel for water heating, kWh/month	121.1912	107.7012	115.5973	104.2902	102.9351	71.3677	70.7223	73.3260	73.9017	106.1046	109.9542	120.2021 (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	27.4673	24.8092	27.4673	26.5813	27.4673	26.5813	27.4673	27.4673	26.5813	27.4673	26.5813	27.4673 (231)
Lighting	30.3705	24.3644	21.9374	16.0723	12.4147	10.1429	11.3251	14.7208	19.1209	25.0876	28.3364	31.2146 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												408.9324 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.7807
Water heating fuel used												1177.2938 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)												
mechanical ventilation fans (SFP = 0.9240)												323.4054 (230a)

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Total electricity for the above, kWh/year	323.4054	(231)
Electricity for lighting (calculated in Appendix L)	245.1076	(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	2154.7391	(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	408.9324	0.1590	65.0020 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1177.2938	0.1422	167.4428 (264)
Space and water heating			232.4448 (265)
Pumps, fans and electric keep-hot	323.4054	0.1387	44.8603 (267)
Energy for lighting	245.1076	0.1443	35.3766 (268)
Total CO2, kg/year			312.6817 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9400 (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	408.9324	1.5884	649.5344 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1177.2938	1.5260	1796.5482 (278)
Space and water heating			2446.0826 (279)
Pumps, fans and electric keep-hot	323.4054	1.5128	489.2476 (281)
Energy for lighting	245.1076	1.5338	375.9542 (282)
Total Primary energy kWh/year			3311.2845 (286)
Dwelling Primary energy Rate (DPER)			31.1500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	53.4000 (1b)	x 2.4000 (2b)	= 128.1600 (1b) - (3b)
First floor	52.9100 (1c)	x 3.0000 (2c)	= 158.7300 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	286.8900 (5)

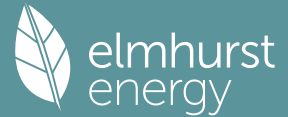
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1394 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3894 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3602 (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	0.4593	0.4503	0.4413	0.3962	0.3872	0.3422	0.3422	0.3332	0.3602	0.3872	0.4052	0.4233 (22b)
Effective ac	0.6055	0.6014	0.5974	0.5785	0.5750	0.5586	0.5586	0.5555	0.5649	0.5750	0.5821	0.5896 (25)

3. Heat losses and heat loss parameter

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Element			Gross m2	Openings m2		NetArea m2	U-value W/m2K	A x U W/K		K-value kJ/m2K	A x K kJ/K		
Main dwelling													
TER Opaque door						2.2100	1.0000	2.2100				(26)	
TER Opening Type						15.4500	1.1450	17.6908				(27)	
Ground						53.4000	0.1300	6.9420				(28a)	
00 Ext Wall			51.8600	11.8300		40.0300	0.1800	7.2054				(29a)	
01 Ext Wall			61.4700	5.8300		55.6400	0.1800	10.0152				(29a)	
External Roof 1			53.4000			53.4000	0.1100	5.8740				(30)	
Total net area of external elements Aum(A, m2)						220.1300						(31)	
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		49.9374				(33)	
Main dwelling													
Ground						23.2000	0.0000	0.0000				(32)	
First						29.0100	0.0000	0.0000				(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											321.7921	(35)	
List of Thermal Bridges													
K1 Element							Length	Psi-value		Total			
E1 Steel lintel with perforated steel base plate							12.3400	0.0500		0.6170			
E3 Sill							11.2900	0.0500		0.5645			
E4 Jamb							33.0000	0.0500		1.6500			
E5 Ground floor (normal)							21.6100	0.1600		3.4576			
E6 Intermediate floor within a dwelling							20.4900	0.0000		0.0000			
E16 Corner (normal)							10.8000	0.0900		0.9720			
E18 Party wall between dwellings							10.8000	0.0600		0.6480			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											7.9091	(36)	
Point Thermal bridges										(36a) =	0.0000		
Total fabric heat loss										(33) + (36) + (36a) =	57.8465	(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	57.3220	56.9342	56.5542	54.7691	54.4351	52.8803	52.8803	52.5924	53.4792	54.4351	55.1107	55.8171	(38)
Average = Sum(39)m / 12 =	115.1685	114.7808	114.4007	112.6156	112.2816	110.7268	110.7268	110.4389	111.3257	112.2816	112.9573	113.6636	(39)
												112.6140	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0833	1.0797	1.0761	1.0593	1.0562	1.0415	1.0415	1.0388	1.0472	1.0562	1.0625	1.0692	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

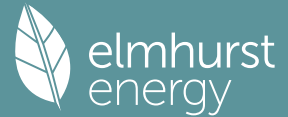
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.7908 (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													
	81.9078	80.6914	78.9784	75.8199	73.4548	70.8324	69.4159	71.1169	72.9690	75.7751	78.9987	81.6309	(42b)
Hot water usage for other uses													
	43.2102	41.6390	40.0677	38.4964	36.9251	35.3538	35.3538	36.9251	38.4964	40.0677	41.6390	43.2102	(42c)
Average daily hot water use (litres/day)													115.2235 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	125.1181	122.3303	119.0460	114.3163	110.3800	106.1862	104.7697	108.0420	111.4654	115.8428	120.6376	124.8412	(44)
Energy conte	198.1564	174.1968	182.9693	156.4933	148.5926	130.5684	126.7099	133.7786	137.4480	157.1976	171.8704	195.4711	(45)
Energy content (annual)										Total = Sum(45)m =		1913.4524	
Distribution loss (46)m = 0.15 x (45)m													
	29.7235	26.1295	27.4454	23.4740	22.2889	19.5853	19.0065	20.0668	20.6172	23.5796	25.7806	29.3207	(46)
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage													
	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	249.0825	220.1945	233.8954	205.7766	199.5187	179.8517	177.6360	184.7047	186.7313	208.1237	221.1537	246.3972	(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	249.0825	220.1945	233.8954	205.7766	199.5187	179.8517	177.6360	184.7047	186.7313	208.1237	221.1537	246.3972	(64)
										Total per year (kWh/year) = Sum(64)m =		2513.0659	(64)
12Total per year (kWh/year)												2513	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month													
	106.6279	94.7186	101.5782	91.4607	90.1479	82.8406	82.8719	85.2222	85.1281	93.0091	96.5735	105.7350	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	139.5383	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	142.8573	158.1635	142.8573	147.6193	142.8573	147.6193	142.8573	142.8573	147.6193	142.8573	147.6193	142.8573	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	266.1439	268.9057	261.9462	247.1302	228.4278	210.8501	199.1071	196.3453	203.3048	218.1208	236.8233	254.4010	(68)
Pumps, fans	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	36.9538	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	-111.6307	(71)
Water heating gains (Table 5)													
	143.3170	140.9503	136.5298	127.0287	121.1666	115.0564	111.3870	114.5460	118.2335	125.0122	134.1299	142.1169	(72)
Total internal gains	620.1798	635.8810	609.1948	589.6397	560.3131	538.3872	518.2129	518.6102	534.0191	553.8518	586.4339	607.2367	(73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					0.6500	10.6334	0.6300	0.7000	0.7700	2.1123 (74)		
East					8.2200	19.6403	0.6300	0.7000	0.7700	49.3391 (76)		
South					2.2900	46.7521	0.6300	0.7000	0.7700	32.7196 (78)		
West					4.2900	19.6403	0.6300	0.7000	0.7700	25.7500 (80)		
Solar gains	109.9209	204.5131	317.0258	440.9728	527.6133	535.8722	511.8154	447.1465	360.9001	236.9005	135.0169	91.7832 (83)
Total gains	730.1007	840.3941	926.2206	1030.6125	1087.9264	1074.2595	1030.0283	965.7567	894.9192	790.7523	721.4508	699.0200 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.5113	82.7900	83.0650	84.3817	84.6327	85.8211	85.8211	86.0448	85.3594	84.6327	84.1265	83.6037
alpha	6.5008	6.5193	6.5377	6.6254	6.6422	6.7214	6.7214	6.7363	6.6906	6.6422	6.6084	6.5736
util living area	0.9989	0.9968	0.9901	0.9565	0.8507	0.6454	0.4714	0.5227	0.7950	0.9745	0.9968	0.9991 (86)
MIT	20.0089	20.1610	20.3837	20.6861	20.9010	20.9872	20.9986	20.9973	20.9527	20.6690	20.2915	19.9926 (87)
Th 2	20.0145	20.0175	20.0204	20.0342	20.0368	20.0489	20.0489	20.0511	20.0442	20.0368	20.0316	20.0261 (88)
util rest of house	0.9984	0.9954	0.9857	0.9374	0.7956	0.5565	0.3705	0.4168	0.7111	0.9593	0.9952	0.9988 (89)
MIT 2	18.8633	19.0598	19.3446	19.7266	19.9614	20.0429	20.0485	20.0504	20.0170	19.7149	19.2380	18.8513 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0801	19.2682	19.5413	19.9082	20.1392	20.2216	20.2283	20.2296	20.1941	19.8955	19.4374	19.0673 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.0801	19.2682	19.5413	19.9082	20.1392	20.2216	20.2283	20.2296	20.1941	19.8955	19.4374	19.0673 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9977	0.9939	0.9827	0.9343	0.8021	0.5731	0.3896	0.4370	0.7255	0.9564	0.9937	0.9982 (94)
Useful gains	728.3986	835.2773	910.2195	962.9449	872.6627	615.6812	401.3164	422.0230	649.2329	756.2913	716.9335	697.7809 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1702.2012	1649.1978	1491.9318	1239.6928	947.5725	622.4652	401.7542	422.9376	678.4321	1043.7122	1393.6010	1689.8737 (97)
Space heating kWh	724.5091	546.9546	432.7940	199.2585	55.7329	0.0000	0.0000	0.0000	0.0000	213.8411	487.2006	738.1170 (98a)
Space heating requirement - total per year (kWh/year)	3398.4080											
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	724.5091	546.9546	432.7940	199.2585	55.7329	0.0000	0.0000	0.0000	0.0000	213.8411	487.2006	738.1170 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3398.4080											
Space heating per m2	(98c) / (4) = 31.9670 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.3000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	724.5091	546.9546	432.7940	199.2585	55.7329	0.0000	0.0000	0.0000	0.0000	213.8411	487.2006	738.1170 (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)	784.9503	592.5836	468.8992	215.8814	60.3824	0.0000	0.0000	0.0000	0.0000	231.6805	527.8447	799.6934 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	249.0825	220.1945	233.8954	205.7766	199.5187	179.8517	177.6360	184.7047	186.7313	208.1237	221.1537	246.3972 (64)
Efficiency of water heater	86.3096	86.0155	85.4201	83.9876	81.6059	79.8000	79.8000	79.8000	79.8000	84.1206	85.7796	79.8000 (216)
Fuel for water heating, kWh/month	288.5918	255.9939	273.8176	245.0082	244.4906	225.3780	222.6015	231.4595	233.9991	247.4110	257.8163	285.3063 (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	29.6829	23.8128	21.4407	15.7084	12.1336	9.9133	11.0687	14.3875	18.6880	24.5196	27.6948	30.5079 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-48.5297	-67.6878	-96.2458	-106.9765	-114.2745	-106.2239	-104.8595	-99.4949	-89.9015	-76.7756	-53.0735	-42.0387 (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)	-29.6584	-62.1300	-123.0355	-184.1619	-242.9365	-243.9377	-241.1131	-204.4462	-150.2161	-88.6937	-39.5412	-23.4767 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)										
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(235d)
Annual totals kWh/year										
Space heating fuel - main system 1										3681.9155 (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										3011.8738 (219)
Space cooling fuel										0.0000 (221)
Electricity for pumps and fans:										
Total electricity for the above, kWh/year										86.0000 (231)
Electricity for lighting (calculated in Appendix L)										239.5583 (232)
Energy saving/generation technologies (Appendices M ,N and Q)										
PV generation										-2639.4289 (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										4379.9186 (238)

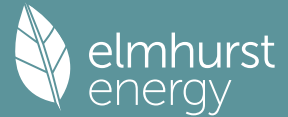
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3681.9155	0.2100	773.2022 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3011.8738	0.2100	632.4935 (264)
Space and water heating			1405.6957 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	239.5583	0.1443	34.5757 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1006.0818	0.1348	-135.6534
PV Unit electricity exported	-1633.3471	0.1260	-205.7887
Total			-341.4421 (269)
Total CO2, kg/year			1110.7585 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3681.9155	1.1300	4160.5645 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3011.8738	1.1300	3403.4173 (278)
Space and water heating			7563.9818 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	239.5583	1.5338	367.4425 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1006.0818	1.4983	-1507.4479
PV Unit electricity exported	-1633.3471	0.4625	-755.3926
Total			-2262.8405 (283)
Total Primary energy kWh/year			5798.6846 (286)
Target Primary Energy Rate (TPER)			54.5500 (287)

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Plot Reference	Plot 48				Issued on Date	17/12/2025	
Assessment Reference	Plot 48			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	86 B	DER	3.08	TER	10.90		
Environmental	97 A	% DER < TER				71.74	
CO ₂ Emissions (t/year)	0.3	DFEE	37.69	TFEE	39.50		
Compliance Check	See BREL	% DFEE < TFEE				4.58	
% DPER < TPER	42.81	DPER	32.60	TPER	57.00		
Assessor Details	Mr. Andrew Jones				Assessor ID	N955-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	54.2000 (1b)	x 2.4000 (2b)	= 130.0800 (1b) - (3b)
First floor	52.6200 (1c)	x 3.0000 (2c)	= 157.8600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 287.9400 (5)

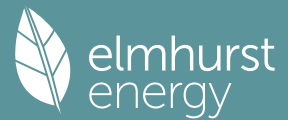
2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	0.0000 / (5) =	
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	2.0000 (17)	
Number of sides sheltered	0.1000 (18)	
Shelter factor	1 (19)	
Infiltration rate adjusted to include shelter factor	(20) = 1 - [0.075 x (19)] =	
	(21) = (18) x (20) =	
	0.9250 (20)	
	0.0925 (21)	
Wind speed	Jan 5.1000	Feb 5.0000
Wind factor	Mar 4.9000	Apr 4.4000
Adj infilt rate	May 4.3000	Jun 3.8000
	Jul 3.8000	Aug 3.7000
	Sep 4.0000	Oct 4.3000
	Nov 4.5000	Dec 4.7000 (22)
	1.2750	1.2500
	1.2250	1.1000
	0.1179	0.1156
	0.1133	0.1018
	0.0994	0.0879
	0.0879	0.0856
	0.0925	0.0994
	0.1041	0.1087 (22b)
Balanced mechanical ventilation with heat recovery	0.5000 (23a)	
If mechanical ventilation	0.5000 (23b)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	83.7000 (23c)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		
Effective ac	0.1994	0.1971
	0.1948	0.1832
	0.1809	0.1694
	0.1694	0.1671
	0.1740	0.1809
	0.1856	0.1902 (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							
Glazing			14.0900	0.7752	10.9225		(27)
Front Door			2.2100	1.0000	2.2100		(26)
Ground			53.4000	0.0800	4.2720	75.0000	4005.0000 (28a)
00 Ext Wall	52.9200	10.6000	42.3200	0.1000	4.2320	190.0000	8040.7997 (29a)
01 Ext Wall	61.2600	5.7000	55.5600	0.1000	5.5560	190.0000	10556.3997 (29a)
External Roof 1	77.2100		77.2100	0.0900	6.9489	9.0000	694.8900 (30)
Total net area of external elements Aum(A, m ²)			244.7900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.1414		(33)
Main dwelling							
Ground			23.2300	0.0000	0.0000	180.0000	4181.3999 (32)
First			29.0400	0.0000	0.0000	180.0000	5227.2002 (32)
Ground			31.9400			9.0000	287.4600 (32c)
First			47.6200			9.0000	428.5800 (32c)
First			52.9100			18.0000	952.3800 (32d)

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Ground	54.2000					9.0000					487.8000 (32e)		
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =						34861.9094 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												326.3613 (35)	
Thermal bridges (User defined value 0.100 * total exposed area)												24.4790 (36)	
Point Thermal bridges						(36a) =						0.0000	
Total fabric heat loss						(33) + (36) + (36a) =						58.6204 (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	
	18.9506	18.7309	18.5111	17.4125	17.1927	16.0940	16.0940	15.8743	16.5335	17.1927	17.6322	18.0717 (38)	
Heat transfer coeff	77.5710	77.3512	77.1315	76.0328	75.8131	74.7144	74.7144	74.4947	75.1539	75.8131	76.2526	76.6920 (39)	
Average = Sum(39)m / 12 =													
												75.9779	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.7262	0.7241	0.7221	0.7118	0.7097	0.6994	0.6994	0.6974	0.7036	0.7097	0.7138	0.7180 (40)	
HLP (average)												0.7113	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7943 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	86.2916	85.0100	83.2053	79.8778	77.3862	74.6234	73.1311	74.9231	76.8744	79.8307	83.2267	85.9998 (42b)
Hot water usage for other uses	45.5229	43.8675	42.2121	40.5567	38.9014	37.2460	37.2460	38.9014	40.5567	42.2121	43.8675	45.5229 (42c)
Average daily hot water use (litres/day)												121.3903 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.8144	128.8775	125.4174	120.4345	116.2875	111.8694	110.3770	113.8245	117.4311	122.0428	127.0942	131.5227 (44)
Energy content (annual)	208.7619	183.5199	192.7619	164.8689	156.5454	137.5564	133.4915	140.9385	144.8043	165.6109	181.0690	205.9328 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2015.8612
Water storage loss (or HIU loss):	31.3143	27.5280	28.9143	24.7303	23.4818	20.6335	20.0237	21.1408	21.7206	24.8416	27.1603	30.8899 (46)
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.0140 (55)
Total storage loss	31.4340	28.3920	31.4340	30.4200	31.4340	30.4200	31.4340	31.4340	30.4200	31.4340	30.4200	31.4340 (56)
If cylinder contains dedicated solar storage	31.4340	28.3920	31.4340	30.4200	31.4340	30.4200	31.4340	31.4340	30.4200	31.4340	30.4200	31.4340 (57)
Primary loss	106.3213	96.0322	106.3213	102.8916	106.3213	36.0948	37.2980	37.2980	36.0948	106.3213	102.8916	106.3213 (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	346.5172	307.9440	330.5173	298.1805	294.3007	204.0712	202.2234	209.6704	211.3191	303.3662	314.3806	343.6881 (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	346.5172	307.9440	330.5173	298.1805	294.3007	204.0712	202.2234	209.6704	211.3191	303.3662	314.3806	343.6881 (64)
12Total per year (kWh/year)												3366.1787 (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	154.4704	137.8461	149.1504	137.1322	137.1084	74.6134	74.2243	76.7004	77.0233	140.1227	142.5187	153.5297 (65)

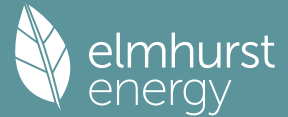
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.3268	162.0047	146.3268	151.2044	146.3268	151.2044	146.3268	146.3268	151.2044	146.3268	151.2044	146.3268 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.9055	269.6752	262.6957	247.8374	229.0814	211.4534	199.6768	196.9072	203.8866	218.7450	237.5009	255.1289 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716 (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)	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732 (71)
Water heating gains (Table 5)	207.6215	205.1281	200.4710	190.4614	184.2855	103.6297	99.7638	103.0920	106.9768	188.3369	197.9427	206.3571 (72)
Total internal gains	685.7687	701.7229	674.4085	654.4181	624.6087	531.2024	510.6824	511.2409	526.9827	618.3236	651.5629	672.7278 (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				8.1900	10.6334	0.4500	0.8000	0.7700	21.7266 (74)			
South				4.3100	46.7521	0.4500	0.8000	0.7700	50.2706 (78)			
West				1.5900	19.6403	0.4500	0.8000	0.7700	7.7908 (80)			
Solar gains	79.7879	139.0912	200.5265	268.4629	321.0392	328.2200	312.4437	271.3987	223.5727	156.3098	96.1045	67.9575 (83)
Total gains	765.5567	840.8141	874.9350	922.8809	945.6479	859.4224	823.1261	782.6396	750.5554	774.6334	747.6674	740.6853 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	124.8388	125.1934	125.5500	127.3642	127.7334	129.6117	129.6117	129.9940	128.8538	127.7334	126.9972	126.2695
alpha	9.3226	9.3462	9.3700	9.4909	9.5156	9.6408	9.6408	9.6663	9.5903	9.5156	9.4665	9.4180
util living area	0.9970	0.9916	0.9763	0.9033	0.7334	0.5555	0.3993	0.4378	0.6846	0.9127	0.9889	0.9977 (86)
Living	20.6225	20.7005	20.7958	20.9112	20.9598	20.9672	20.9676	20.9677	20.9644	20.9145	20.7595	20.6112
Non living	19.9739	20.0524	20.1462	20.2579	20.2955	20.3088	20.3090	20.3109	20.3039	20.2638	20.1189	19.9693
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	20.8069	20.7005	20.7958	20.9112	20.9598	20.9672	20.9676	20.9677	20.9644	20.9145	20.7595	20.6656 (87)
Th 2	20.3178	20.3196	20.3214	20.3304	20.3322	20.3413	20.3413	20.3431	20.3377	20.3322	20.3286	20.3250 (88)
util rest of house	0.9958	0.9884	0.9677	0.8753	0.6855	0.4988	0.3396	0.3753	0.6220	0.8814	0.9841	0.9968 (89)
MIT 2	20.1419	20.0524	20.1462	20.2579	20.2955	20.3088	20.3090	20.3109	20.3039	20.2638	20.1189	20.0191 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.2671	20.1745	20.2686	20.3809	20.4206	20.4328	20.4330	20.4346	20.4283	20.3864	20.2396	20.1409 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2671	20.1745	20.2686	20.3809	20.4206	20.4328	20.4330	20.4346	20.4283	20.3864	20.2396	20.1409 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9876	0.9669	0.8776	0.6920	0.5067	0.3479	0.3840	0.6307	0.8842	0.9833	0.9965 (94)
Useful gains	762.2374	830.4166	845.9668	809.9216	654.3785	435.4878	286.3769	300.5385	473.3894	684.9526	735.2086	738.0670 (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	1238.5851	1181.4976	1061.9893	872.9280	661.1357	435.7961	286.3840	300.5563	475.5993	741.9340	1001.9257	1222.5366 (97)
Space heating kWh	354.4027	235.9264	160.7208	45.3646	5.0274	0.0000	0.0000	0.0000	0.0000	42.3942	192.0363	360.4453 (98a)
Space heating requirement - total per year (kWh/year)												1396.3177
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	354.4027	235.9264	160.7208	45.3646	5.0274	0.0000	0.0000	0.0000	0.0000	42.3942	192.0363	360.4453 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1396.3177
Space heating per m2										(98c) / (4) =		13.0717 (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 %)												273.6820 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	354.4027	235.9264	160.7208	45.3646	5.0274	0.0000	0.0000	0.0000	0.0000	42.3942	192.0363	360.4453 (98)
Space heating efficiency (main heating system 1)	273.6820	273.6820	273.6820	273.6820	273.6820	0.0000	0.0000	0.0000	0.0000	273.6820	273.6820	273.6820 (210)
Space heating fuel (main heating system)	129.4943	86.2046	58.7254	16.5757	1.8369	0.0000	0.0000	0.0000	0.0000	15.4903	70.1677	131.7022 (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	346.5172	307.9440	330.5173	298.1805	294.3007	204.0712	202.2234	209.6704	211.3191	303.3662	314.3806	343.6881 (64)
Efficiency of water heater	285.8132	285.8132	285.8132	285.8132	285.8132	285.8132	285.8132	285.8132	285.8132	285.8132	285.8132	285.8132 (216)
Fuel for water heating, kWh/month	121.2390	107.7431	115.6410	104.3270	102.9696	71.4002	70.7537	73.3593	73.9361	106.1414	109.9951	120.2492 (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	27.5678	24.9000	27.5678	26.6785	27.5678	26.6785	27.5678	27.5678	26.6785	27.5678	26.6785	27.5678 (231)
Lighting	31.1081	24.9561	22.4702	16.4626	12.7162	10.3892	11.6001	15.0783	19.5852	25.6969	29.0246	31.9727 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												510.1971 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												285.8132
Water heating fuel used												1177.7547 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)												
mechanical ventilation fans (SFP = 0.9240)												324.5890 (230a)
Total electricity for the above, kWh/year												324.5890 (231)

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Electricity for lighting (calculated in Appendix L)	251.0604	(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	2263.6011	(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	510.1971	0.1581	80.6675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1177.7547	0.1422	167.5079	(264)
Space and water heating			248.1755	(265)
Pumps, fans and electric keep-hot	324.5890	0.1387	45.0245	(267)
Energy for lighting	251.0604	0.1443	36.2358	(268)
Total CO2, kg/year			329.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0800	(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	510.1971	1.5853	808.8165	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1177.7547	1.5260	1797.2501	(278)
Space and water heating			2606.0666	(279)
Pumps, fans and electric keep-hot	324.5890	1.5128	491.0383	(281)
Energy for lighting	251.0604	1.5338	385.0847	(282)
Total Primary energy kWh/year			3482.1896	(286)
Dwelling Primary energy Rate (DPER)			32.6000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2000 (1b)	x	2.4000 (2b)	=	130.0800 (1b) - (3b)	
First floor	52.6200 (1c)	x	3.0000 (2c)	=	157.8600 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.8200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	287.9400	(5)

2. Ventilation rate

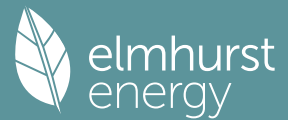
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1389 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3889	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3597 (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	0.4587	0.4497	0.4407	0.3957	0.3867	0.3418	0.3418	0.3328	0.3597	0.3867	0.4047	0.4227	(22b)
Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling			m2			m2			W/m2K			W/K			kJ/m2K			kJ/K	
TER Opaque door						2.2100			1.0000			2.2100						(26)	
TER Opening Type						14.0900			1.1450			16.1336						(27)	
Ground						53.4000			0.1300			6.9420						(28a)	
00 Ext Wall			52.9200		10.6000	42.3200		0.1800				7.6176						(29a)	
01 Ext Wall			61.2600		5.7000	55.5600		0.1800				10.0008						(29a)	
External Roof 1			77.2100			77.2100		0.1100				8.4931						(30)	
Total net area of external elements Aum(A, m2)						244.7900												(31)	
Fabric heat loss, W/K = Sum (A x U)									(26)...(30) + (32) =			51.3971						(33)	
Main dwelling																			
Ground						23.2300			0.0000			0.0000						(32)	
First						29.0400			0.0000			0.0000						(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K																		326.3613 (35)	
List of Thermal Bridges																			
K1 Element									Length			Psi-value			Total				
E1 Steel lintel with perforated steel base plate									11.2900			0.0500			0.5645				
E3 Sill									10.2400			0.0500			0.5120				
E4 Jamb									27.7200			0.0500			1.3860				
E5 Ground floor (normal)									22.0500			0.1600			3.5280				
E6 Intermediate floor within a dwelling									20.4200			0.0000			0.0000				
E16 Corner (normal)									10.8000			0.0900			0.9720				
E18 Party wall between dwellings									10.8000			0.0600			0.6480				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																		7.6105 (36)	
Point Thermal bridges															(36a) =			0.0000	
Total fabric heat loss												(33) + (36) + (36a) =						59.0076 (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	57.5056	57.1175	56.7370	54.9501	54.6157	53.0593	53.0593	52.7711	53.6588	54.6157	55.2921	55.9992	(38)						
Average = Sum(39)m / 12 =	116.5132	116.1251	115.7446	113.9576	113.6233	112.0669	112.0669	111.7787	112.6664	113.6233	114.2997	115.0068	(39)					113.9560	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
HLP (average)	1.0907	1.0871	1.0835	1.0668	1.0637	1.0491	1.0491	1.0464	1.0547	1.0637	1.0700	1.0766	(40)					1.0668	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31						31	

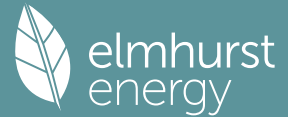
4. Water heating energy requirements (kWh/year)																			

Assumed occupancy													2.7943	(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	81.9770	80.7595	79.0451	75.8839	73.5169	70.8922	69.4745	71.1770	73.0306	75.8391	79.0654	81.6999	(42b)						
Hot water usage for other uses	43.2467	41.6741	40.1015	38.5289	36.9563	35.3837	35.3837	36.9563	38.5289	40.1015	41.6741	43.2467	(42c)						
Average daily hot water use (litres/day)													115.3208	(43)					
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Energy conte	125.2237	122.4336	119.1466	114.4128	110.4732	106.2759	104.8582	108.1333	111.5595	115.9406	120.7395	124.9466	(44)						
Energy content (annual)	198.3238	174.3439	183.1238	156.6254	148.7181	130.6786	126.8169	133.8916	137.5641	157.3303	172.0155	195.6362	(45)						
Distribution loss (46)m = 0.15 x (45)m													29.7486	(46)					
Water storage loss (or HIU loss):													200.0000	(47)					
Store volume													1.6525	(48)					
a) If manufacturer declared loss factor is known (kWh/day):													0.5400	(49)					
Temperature factor from Table 2b													0.8924	(55)					
Enter (49) or (54) in (55)																			
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)						
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(57)						
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)						
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)						
Total heat required for water heating calculated for each month	249.2498	220.3416	234.0499	205.9087	199.6442	179.9619	177.7430	184.8176	186.8474	208.2564	221.2988	246.5622	(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	249.2498	220.3416	234.0499	205.9087	199.6442	179.9619	177.7430	184.8176	186.8474	208.2564	221.2988	246.5622	(64)						
12Total per year (kWh/year)													2514.6816	(64)					
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)						
Heat gains from water heating, kWh/month	106.6835	94.7675	101.6295	91.5046	90.1896	82.8773	82.9075	85.2598	85.1667	93.0532	96.6218	105.7899	(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	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	139.7165	(66)						
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.3268	162.0047	146.3268	151.2044	146.3268	151.2044	146.3268	146.3268	151.2044	146.3268	151.2044	146.3268	(67)						
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.9055	269.6752	262.6957	247.8374	229.0814	211.4534	199.6768	196.9072	203.8866	218.7450	237.5009	255.1289	(68)						
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	36.9716	(69)						
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)						
Losses e.g. evaporation (negative values) (Table 5)	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	-111.7732	(71)						
Water heating gains (Table 5)	143.3918	141.0231	136.5988	127.0897	121.2226	115.1073	111.4348	114.5965	118.2871	125.0715	134.1969	142.1907	(72)						
Total internal gains	624.5391	640.6179	613.5363	594.0464	564.5458	542.6801	522.3534	522.7455	538.2930	558.0582	590.8172	611.5614	(73)						

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6b	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W
North	8.1900				10.6334		0.6300		0.7000	0.7700	26.6151 (74)
South	4.3100				46.7521		0.6300		0.7000	0.7700	61.5814 (78)
West	1.5900				19.6403		0.6300		0.7000	0.7700	9.5437 (80)
Solar gains	97.7402	170.3868	245.6450	328.8670	393.2730	402.0695	382.7435	332.4634	273.8765	191.4795	83.2479 (83)
Total gains	722.2793	811.0047	859.1814	922.9134	957.8188	944.7496	905.0969	855.2089	812.1695	749.5377	694.8093 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)											
tau	83.1139	83.3917	83.6658	84.9777	85.2278	86.4114	86.4114	86.6343	85.9516	85.2278	84.7235
alpha	6.5409	6.5594	6.5777	6.6652	6.6819	6.7608	6.7608	6.7756	6.7301	6.6819	6.6482
util living area	0.9990	0.9976	0.9940	0.9761	0.9084	0.7270	0.5407	0.5935	0.8508	0.9820	0.9974
MIT	20.0018	20.1347	20.3271	20.6088	20.8472	20.9751	20.9969	20.9945	20.9292	20.6351	20.2785
Th 2	20.0084	20.0114	20.0143	20.0280	20.0306	20.0426	20.0426	20.0448	20.0380	20.0306	20.0254
util rest of house	0.9986	0.9966	0.9911	0.9641	0.8646	0.6333	0.4255	0.4747	0.7730	0.9705	0.9961
MIT 2	18.8480	19.0204	19.2678	19.6308	19.9062	20.0304	20.0419	20.0433	19.9947	19.6691	19.2155
Living area fraction											
MIT	19.0654	19.2303	19.4674	19.8150	20.0835	20.2083	20.2218	20.2225	20.1707	19.8511	19.4157
Temperature adjustment											
adjusted MIT	19.0654	19.2303	19.4674	19.8150	20.0835	20.2083	20.2218	20.2225	20.1707	19.8511	19.4157

8. Space heating requirement

Utilisation	0.9980	0.9954	0.9889	0.9607	0.8674	0.6505	0.4473	0.4973	0.7852	0.9676	0.9948	0.9985 (94)
Useful gains	720.8421	807.2622	849.6776	886.6511	830.8256	614.5401	404.8886	425.3248	637.7411	725.2814	704.8587	693.7347 (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	1720.3584	1664.1056	1500.9023	1243.8453	952.5555	628.5064	405.8796	427.2749	683.9618	1051.1364	1407.6856	1708.5788 (97)
Space heating kWh	743.6401	575.7988	484.5112	257.1798	90.5671	0.0000	0.0000	0.0000	0.0000	242.4361	506.0354	755.0441 (98a)
Space heating requirement - total per year (kWh/year)												3655.2125
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	743.6401	575.7988	484.5112	257.1798	90.5671	0.0000	0.0000	0.0000	0.0000	242.4361	506.0354	755.0441 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3655.2125
Space heating per m2										(98c) / (4) =		34.2184 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	743.6401	575.7988	484.5112	257.1798	90.5671	0.0000	0.0000	0.0000	0.0000	242.4361	506.0354	755.0441 (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)	805.6772	623.8340	524.9308	278.6347	98.1225	0.0000	0.0000	0.0000	0.0000	262.6610	548.2507	818.0326 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	249.2498	220.3416	234.0499	205.9087	199.6442	179.9619	177.7430	184.8176	186.8474	208.2564	221.2988	246.5622 (64)
Efficiency of water heater	86.3551	86.1121	85.6535	84.5595	82.4064	79.8000	79.8000	79.8000	79.8000	84.4015	85.8539	79.8000 (216)
Fuel for water heating, kWh/month	288.6336	255.8776	273.2521	243.5074	242.2677	225.5162	222.7355	231.6010	234.1446	246.7450	257.7621	285.3689 (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	30.4038	24.3911	21.9615	16.0899	12.4283	10.1540	11.3375	14.7369	19.1418	25.1151	28.3675	31.2488 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-49.1318	-68.4595	-97.2415	-107.9613	-115.2204	-107.0637	-105.6942	-100.3475	-90.7569	-77.6062	-53.7107	-42.5688 (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)	-30.2277	-63.3032	-125.3249	-187.5387	-247.3421	-248.3437	-245.4616	-208.1470	-152.9580	-90.3420	-40.2915	-23.9281 (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)

Full SAP Calculation Printout



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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3960.1436 (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												3007.4116 (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)												245.3763 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2678.9708 (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												4619.9606 (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	3960.1436	0.2100	831.6301 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3007.4116	0.2100	631.5564 (264)
Space and water heating			1463.1866 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.3763	0.1443	35.4154 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1015.7625	0.1349	-136.9820
PV Unit electricity exported	-1663.2083	0.1260	-209.5649
Total			-346.5468 (269)
Total CO2, kg/year			1163.9844 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9000 (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	3960.1436	1.1300	4474.9622 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3007.4116	1.1300	3398.3752 (278)
Space and water heating			7873.3374 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	245.3763	1.5338	376.3663 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1015.7625	1.4984	-1522.0401
PV Unit electricity exported	-1663.2083	0.4625	-769.2544
Total			-2291.2945 (283)
Total Primary energy kWh/year			6088.5100 (286)
Target Primary Energy Rate (TPER)			57.0000 (287)



Appendix B – North Herts Bronze, Silver, Gold Checklist



Theme	Achievable Requirements	Design Measures
1. Optimising Passive Design & Fabric Performance		
Residential Applications of 10-99 dwellings	Bronze: Submit a Sustainability & Energy Statement showing compliance with Policy and Building Regulations (this should include the Energy Use Intensity (EUI) & the total Space Heating Demand (SHD) calculations with recommendations on methods that could be investigated during technical design to improve performance).	A Sustainability and Energy Statement to be submitted showing the EUI and SHD.
	Silver: Achieve 80% EPC ratings of at least B and 20% of at least C	Through highly efficient building fabric and MEPH proposals. Specified MEPH plant includes individual air source heat pumps
Level achieved: Silver		
2. Achieving Low Carbon Energy	Bronze: Ensure development is Policy & Building Regulations compliant.	Building Regulations compliance will be achieved within all relevant areas of low carbon energy
	Bronze: Larger schemes (>10 dwellings) are encouraged to submit a Feasibility Study from an Energy Specialist showing how the most appropriate Low/Zero Carbon technology will be implemented on site	N/A.
Level achieved: Bronze		
3. Minimising Carbon Footprint		
Whole Life Carbon Assessment: All residential development	Bronze: Ensure compliance with Policy and Building Regulations including Part Z, if and when it is introduced. Discussions around reducing emissions will be required	Policy and Building Regulations compliance will be achieved.
	Bronze: Applicants are encouraged to consider Whole Life Carbon (WLC) for Major Development, and methods for reducing emissions during the technical design stages	N/A.
Circular Economy Principles	Bronze: Ensure compliance with Policy and Building Regulations	Policy and Building Regulations compliance will be achieved.



Theme	Achievable Requirements	Design Measures
Level achieved: Bronze		
4. Healthy Placemaking		
Residential and Non-Residential	Bronze: Ensure compliance with Policy requirements and open space standards	The scheme will comply with policy requirements and open space standards.
	Silver: All schemes must submit a landscaping strategy	Landscaping Report to be submitted by Landscape Architect
	Silver: Green Infrastructure design should follow Natural England's Green Infrastructure Principles.	N/A.
	Silver: Ensure all schemes propose play, community amenity and food production opportunities. Fields in Trust distances should be followed for play spaces and locations mapped with walking isochrones.	The scheme will provide play and community amenity in the form of a play space and significant open space areas to the East.
	Silver: Ensure all schemes embed key aspects of healthy placemaking as outlined in the NHS Putting Health into Place guidance	N/A.
	Silver: Ensure 50% of all flat roofs are green or blue roofs.	N/A.
	Silver: Ensure that an air quality assessment is undertaken to achieve air quality neutral (AQN) or provide justification of why AQN is not possible.	Air Quality Assessment Report to be submitted by a certified Air Quality Assessor
	Silver: Undertake an overheating risk assessment to assess residential dwellings against TM59 and Part O ensuring compliance at planning stage – prioritising passive measures.	TM59/Part O Analysis to be carried out and submitted at planning stage
	Silver: Undertake an acoustic assessment to confirm performance against Part O acoustic criteria for the overheating assessment. All domestic units to meet Part M4(1).	Domestic acoustic assessment to be carried out by certified acoustic consultant
	Silver: Ensure the development scheme includes community allotments.	N/A.
	Bronze: Not applicable.	N/A.
Level achieved: Bronze with an additional 5 silver levels.		
5. Promoting Biodiversity		



Theme	Achievable Requirements	Design Measures
Ecological Surveys & Assessments	Bronze: Carry out and submit a habitat survey to enable metric baselines to be completed, including quadrat survey (where necessary) to demonstrate UK habitats. The survey should be undertaken in line with best practice (e.g. timing and age) and identify Priority/irreplaceable habitats (BS42020).	Within the survey area every parcel of land was classified, recorded and mapped using habitat types specified within the methodology for UKHab survey. Full details of survey methodology, timing and limitations are included within Chapter 2 of the Land at Stevenage Road, Hitchin, Hertfordshire: Preliminary Ecological Appraisal Report (Urban Edge Environmental Consulting Ltd (UEEC), 2025).
	Bronze: A species assessment and follow-up surveys should be completed and submitted according to recommendations required to enable determination – i.e. no outstanding surveys.	The basic Preliminary Ecological Appraisal (PEA) methodology was extended to provide more detail in relation to habitats with potential to support rare or protected fauna. Additional surveys recommended following consideration within the PEA comprised of presence / absence surveys for reptiles only. These surveys are scheduled for Spring 2026. Full details of site assessment and survey methods are provided in Chapters 2, 4 and 5 of the Land at Stevenage Road, Hitchin, Hertfordshire: Preliminary Ecological Appraisal Report (UEEC, 2025).
	In addition to bronze level requirements	
	Silver: Ensure surveys include a review of existing sources of information such as the Hertfordshire Environmental Records Centre, MAGIC or any other appropriate resource.	A desk-based study was undertaken to examine published information and biological records from within the search area. This information was collected from the following sources: • The 'MAGIC' (Multi-agency Geographic Information for the Countryside) website: www.magic.gov.uk; and • Hertfordshire Environmental Records Centre. Full details of the study and results are provided in Chapters 2, 3 and 4 of the Land at Stevenage Road, Hitchin, Hertfordshire: Preliminary Ecological Appraisal Report (UEEC, 2025).
	Silver: Ensure that an assessment of additional features within the site but beyond compensation for species affected is included in the species assessment.	Ecological enhancements, specific species mitigation and / or compensation include: • Habitats creation / specification; and • Biodiversity species (e.g. habitat piles and bat / bird boxes). Full details of the study and results are provided in



Theme	Achievable Requirements	Design Measures
		Chapter 5 of the Land at Stevenage Road, Hitchin, Hertfordshire: Preliminary Ecological Appraisal Report (UEEC, 2025).
Arboriculture Assessment (where trees are impacted by the proposal)	Bronze: Submit a survey of all trees on site, identifying trees of value and potential impacts of offsite trees.	A full Tree Constraints Plan is to be submitted.
Biodiversity Net Gain (BNG)	Bronze: Ensure the Statutory Metric or Small Sites Metric (SSM) is completed and submitted showing baseline value and demonstrate how the mitigation hierarchy has been applied.	A full Biodiversity Net Gain Assessment will be submitted with a completed BNG metric.
	Bronze: Submit a plan showing the habitat proposals achieve at least 10% BNG.	A Biodiversity Net Gain Assessment and Landscaping Plan will demonstrate at least 10% BNG.
	Bronze: Submit a Habitat Management and Monitoring Plan (HMMP) showing how BNG significant habitats are to be managed and monitored	A Habitat Management and Monitoring Plan will be submitted.
Ecological Buffers	Bronze: Ensure the scheme takes account of Natural England's Standing Advice for ancient woodland and veteran trees to provide a 15m buffer in these areas.	As shown in the Tree Constraints Plan, there are no ancient woodland or veteran trees on or close to the site.
	Bronze: Ensure the scheme includes a 10m riparian zone buffer alongside watercourses, where applicable	A 10m riparian zone buffer alongside the watercourse to the east of the Site has been included.
Level achieved: Bronze		
6. Sustainable Travel Transport Statements, Assessments and Travel Plans	Bronze: Submit a Transport statement and travel plan clearly demonstrating how the scheme will facilitate sustainable transport and encourage active travel.	Transport and travel assessment to be carried out by the Transport Consultant
	Bronze: Ensure the scheme includes segregated cycle ways, pedestrian paths away from traffic and integrated with green infrastructure	A full Landscaping Plan will be submitted.
EV Charging	Bronze: Ensure compliance with Policy and the Building Regs Part S	EV chargers to be installed where appropriate or facilitate future connection
Level achieved: Bronze		
7. Conserving Water		
Residential Development	Bronze: Ensure compliance with Policy requirements of 110l/p/d.	Water efficiency calculations will be carried out at design stage and checked at as built stage.
Level achieved: Bronze		



Theme	Achievable Requirements	Design Measures
8. Incorporating Sustainable Drainage		
SUDS Scheme	Bronze: Submit a SuDS strategy and maintenance plan approved by SAB ensuring that surface water run-off is managed as close to its source as possible and the scheme will not increase downstream flood risk. Strategy to include a climate change allowance.	SuDS strategy has been prepared to meet this requirement and is set out the FRA
	Bronze: Ensure that discharge to a combined sewer is avoided unless all other discharge options (infiltration, watercourse, surface water sewer) have been exhausted first, as per discharge hierarchy.	Surface water to drainage by a combination of infiltration and discharge to watercourse at greenfield rate. This is set out in the FRA
	Bronze: Ensure that the scheme achieves greenfield run-off rates unless this is demonstrably not feasible in which case a minimum of 50% reduction will be required. Brownfield sites will need to achieve run-off rates as close to greenfield as possible.	Discharge based on the Greenfield Rate as set out in the FRA
9. Historic Buildings	N/A	N/A