



Land at Pound Farm
Ickleford
SG5 3RS

Phase 1 Detailed Energy &
Sustainability Statement

Planning Issue 1



Applicant Name:	Bugler Homes Ltd
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Site Address:	Land at Pound Farm Ickleford SG5 3RS
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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 Pound Farm.

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 and the SEN School Buildings are summarised in the tables below.

Plot Reference	DER	TER	% DER < TER
Plot 01	3.36	9.78	65.64
Plot 02	3.72	11.47	67.57
Plot 10	3.70	10.95	66.21
Plot 17	3.70	11.15	66.82
Plot 18	3.10	8.68	64.29
Plot 19	3.40	10.02	66.07
Plot 66	3.59	10.49	65.78
Plot 67	3.59	10.70	66.45
Plot 81	3.76	11.10	66.13
Plot 98	3.96	12.05	67.14

Table 1 | Carbon reduction results for typical dwellings

The results show that the typical dwellings within Pound Farm show a carbon reduction of at least 65% which comfortably meets the criteria shown within North Herts Local Plan and associated Supplementary Planning Documents (SPD's).

Plot Reference	BER	TER	% BER < TER	BPER	TPER	% BPER < TPER
Classroom Block NE	4.21	4.89	13.90	45.79	52.8	13.30
Classroom Block NW	4.21	4.88	13.70	45.75	52.75	13.30
Classroom Block SE	4.26	4.91	13.20	46.3	53.09	12.80
Specialist Classroom	2.25	2.73	17.60	22.96	27.87	17.60
Staff Block	4.02	4.60	12.60	43.6	49.61	12.10
Sports Pavilion	4.21	4.54	7.30	45.63	49.12	7.10
Main Hall	2.64	3.46	23.70	26.73	36.28	26.30

Table 2 | Carbon reduction results for the SEN School buildings



1.00 INTRODUCTION

1.01 Purpose of Report

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 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 comprises arable land at the edge of Ickleford.

1.03 Proposed Development

Hybrid application for a mixed-use development to provide a total of up to 230 dwellings, a residential care home (Use Class C2), an independent Special School (ISS) and new sports pitch, with access from Bedford Road, landscaping, parking and SuDS comprising: Phase 1 – Application for full planning permission for the erection of 100 dwellings, an ISS, new sports pitch and associated parking, landscaping, open space and SuDS; Phase 2 – An outline application on the remaining part of the site for the erection of up to 130 dwellings, a residential care home (Use Class C2) and associated works with access from Bedford Road (all matters reserved apart from access).

Phase 1	Phase 2
100 dwellings	Up to 130 dwellings
A new DfE approved Independent Special School (ISS) for Children with Social Emotional Mental Health (SEMH) and Autism Spectrum Disorder) needs (30 places)	A 65-bed care home
A new sports pitch (Any references to padel courts must be removed and replaced with potential future sports pitches/facilities)	Space for up to 2 additional sports pitches



Figure 1 | 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 types were accounted for within the SAP assessments.

The site plan below highlights the typical house types.



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 L1 (2021) Minimum Performance	Part L1 (2021) Notional Performance	Proposed Building Performance
Construction Element	U Value W/m ² K	U Value W/m ² K	U Value W/m ² K
Ground Floor	0.18	0.13	0.07
External Wall	0.26	0.18	0.14
External Wall (detached House)	0.26	0.18	0.13
Roof	0.16	0.11	0.09
Windows	1.60	1.20	0.80
	Infiltration (m ³ /hr.m ² at 50Pa)	Infiltration (m ³ /hr.m ² at 50Pa)	Infiltration (m ³ /hr.m ² at 50Pa)
Air Tightness	8.0	5.0	2.0

Table 3 | Comparison of domestic development fabric specification versus the Building Regulations

	Part L2 (2021) Minimum Performance	Part L2 (2021) Notional Performance	Proposed Building Performance
Construction Element	U Value W/m ² K	U Value W/m ² K	U Value W/m ² K
Ground Floor	0.18	0.15	0.10
External Wall	0.26	0.18	0.10
Roof (Pitched)	0.16	0.15	0.10
Windows	1.60	1.4	1.20
	Infiltration (m ³ /hr.m ² at 50Pa)	Infiltration (m ³ /hr.m ² at 50Pa)	Infiltration (m ³ /hr.m ² at 50Pa)
Air Tightness	8.0	3.0	3.0

Table 4 | Comparison of SEN School buildings 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 5 | 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 below.

Heat Network	
Heat Network Type	Space and Water Combined
Heat Source 1	
Source	Heat Pump
Heating Use	Space & Water
Efficiency (Winter)	262.39
Efficiency (Summer)	175.96
Heating Controls	Programmer and at least two room thermostats
Water Heating	
Hot Water System	Via Heat Source 1

Table 6 | Proposed heating and hot water system for domestic properties

	Classrooms (NE, NW & SE)	Main Hall	Specialist Classroom	Sports Pavilion	Staff Block
Lighting					
Presence Detection	PIR throughout all spaces	PIR throughout all spaces	PIR throughout all spaces	PIR throughout all spaces	PIR throughout all spaces
Photocell Control Dimming	In classrooms only	Hall and Catering Kitchen only	In classrooms only	No dimming controls	In offices only
Lighting efficacy (lm/cw)	110	110	110	110	110
Servicing Strategy					
Heating & Cooling	VRF - classrooms	VRF – Kitchens & Hall Elec Htg - Lobby Extract – Staff change and WC's	VRF - classrooms	VRF – Changing areas Elec Htg - Lobby Extract – WC's	VRF – Offices Elec Htg - Lobby Extract – WC's
Ventilation	Supply & Extract	Supply & Extract – Kitchens and Hall Extract – WC's	Supply & Extract	Supply & Extract – Changing areas Extract – WC's	Supply & Extract – Offices Extract – WC's
Hot Water	Electric water heaters	Electric water heaters	Electric water heaters	Electric water heaters	Electric water heaters
Renewables					
PV		10m2 @ 21% panel efficiency			10m2 @ 21% panel efficiency

Table 7 | Proposed heating, cooling and hot water system for SEN School buildings

6.00

CARBON REDUCTION RESULTS

Plot Reference	DER	TER	% DER < TER
Plot 01	3.36	9.78	65.64
Plot 02	3.72	11.47	67.57
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Plot 67	3.59	10.70	66.45
Plot 81	3.76	11.10	66.13
Plot 98	3.96	12.05	67.14

Table 8 | Carbon reduction results for typical dwellings

The results show that the typical dwellings within Pound Farm show a carbon reduction of at least 65% which comfortably meets the criteria shown within North Herts Local Plan and associated Supplementary Planning Documents (SPD's).

Plot Reference	BER	TER	% BER < TER	BPER	TPER	% BPER < TPER
Classroom Block NE	4.21	4.89	13.90	45.79	52.8	13.30
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Specialist Classroom	2.25	2.73	17.60	22.96	27.87	17.60
Staff Block	4.02	4.60	12.60	43.6	49.61	12.10
Sports Pavilion	4.21	4.54	7.30	45.63	49.12	7.10
Main Hall	2.64	3.46	23.70	26.73	36.28	26.30

Table 9 | Carbon reduction results for the SEN School buildings

The results show that the SEN school buildings within Pound Farm meet Building Regulation compliance which comfortably meets the criteria shown within North Herts Local Plan and associated Supplementary Planning Documents (SPD's).

Summary

The energy strategy for Pound Farm achieves a minimum of 65.44% and maximum of 68.96% reduction in regulated CO₂ emissions against the Part L compliant baseline with regards to the domestic areas of the development and a minimum of 7.30% and maximum of 23.70% reduction in regulated CO₂ emissions for the non-domestic (SEN School buildings) areas of the development

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.

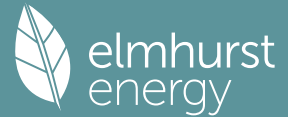


Appendices



Appendix A – SAP Worksheets for Typical Dwellings

Full SAP Calculation Printout



Plot Reference	Plot 01			Issued on Date	29/01/2026	
Assessment Reference	Plot 01		Plot Type Ref			
Plot Address				SAP Version	10.2	
SAP Rating	83 B	DER	3.36	TER	9.78	
Environmental	97 A	% DER < TER				65.64
CO ₂ Emissions (t/year)	0.47	DFEE	41.07	TFEE	42.57	
Compliance Check	See BREL	% DFEE < TFEE				3.53
% DPER < TPER	31.11	DPER	35.33	TPER	51.28	
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	78.5100 (1b)	x 2.6000 (2b)	= 204.1260 (1b) - (3b)
First floor	77.7200 (1c)	x 2.4000 (2c)	= 186.5280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 390.6540 (5)

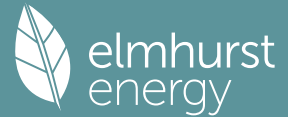
2. Ventilation rate

	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			32.8700	0.7752	25.4806		(27)
Front Door			2.1600	1.0000	2.1600		(26)
Heatloss Floor 1			78.5100	0.0700	5.4957	75.0000	5888.2500 (28a)
00 Ext Wall	110.7300	27.1000	83.6300	0.1400	11.7082	190.0000	15889.7006 (29a)
01 Ext Wall	94.9600	7.9300	87.0300	0.1400	12.1842	190.0000	16535.6998 (29a)
Roof	77.7200		77.7200	0.0900	6.9948	9.0000	699.4800 (30)
Total net area of external elements Aum(A, m ²)			361.9200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.0235		(33)
Main dwelling							
00 Internal Wall			56.4200			9.0000	507.7800 (32c)
01 Internal Wall			73.2000			9.0000	658.8000 (32c)
Internal Floor 1			77.7200			18.0000	1398.9600 (32d)
Ground			77.7200			9.0000	699.4800 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 42278.1504 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 270.6148 (35)
Thermal bridges (User defined value 0.100 * total exposed area) 36.1920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 100.2155 (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	26.9434	26.6211	26.2988	24.6874	24.3651	22.7536	22.7536	22.4314	23.3982	24.3651	25.0097	25.6542 (38)
Average = $\text{Sum}(39)\text{m} / 12 =$	127.1589	126.8366	126.5143	124.9029	124.5806	122.9692	122.9692	122.6469	123.6137	124.5806	125.2252	125.8698 (39)
												124.8223
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8139	0.8119	0.8098	0.7995	0.7974	0.7871	0.7871	0.7850	0.7912	0.7974	0.8015	0.8057 (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												2.9435 (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												
	84.8734	83.6129	81.8379	78.5650	76.1144	73.3970	71.9292	73.6918	75.6110	78.5187	81.8589	84.5865 (42b)
Hot water usage for other uses												
	44.7747	43.1465	41.5184	39.8902	38.2620	36.6339	36.6339	38.2620	39.8902	41.5184	43.1465	44.7747 (42c)
Average daily hot water use (litres/day)												119.3953 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	129.6481	126.7595	123.3562	118.4552	114.3764	110.0308	108.5630	111.9538	115.5012	120.0370	125.0054	129.3612 (44)
Energy content (annual)												
	205.3309	180.5038	189.5940	162.1593	153.9726	135.2957	131.2976	138.6222	142.4245	162.8891	178.0932	202.5484 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1982.7312
	30.7996	27.0756	28.4391	24.3239	23.0959	20.2944	19.6946	20.7933	21.3637	24.4334	26.7140	30.3823 (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												
	264.3909	233.8483	248.6539	219.3141	213.0326	192.4505	190.3575	197.6822	199.5793	221.9491	235.2480	261.6083 (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												
	264.3909	233.8483	248.6539	219.3141	213.0326	192.4505	190.3575	197.6822	199.5793	221.9491	235.2480	261.6083 (64)
Total per year (kWh/year)												2678.1146 (64)
Electric shower(s)												2678 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	115.5205	102.6931	110.2880	99.6418	98.4439	90.7097	90.9044	93.3399	93.0800	101.4086	104.9398	114.5953 (65)

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

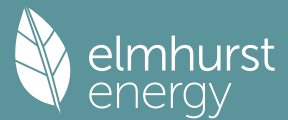
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	165.4764	183.2060	165.4764	170.9922	165.4764	170.9922	165.4764	165.4764	170.9922	165.4764	170.9922	165.4764 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	327.2207	330.6163	322.0596	303.8436	280.8491	259.2376	244.7997	241.4042	249.9608	268.1769	291.1713	312.7829 (68)
Pumps, fans	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177 (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)	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413 (71)
Total internal gains	155.2695	152.8171	148.2365	138.3914	132.3170	125.9857	122.1833	125.4568	129.2777	136.3019	145.7498	154.0259 (72)
	715.1196	733.7923	702.9255	680.3802	645.7955	623.3685	599.6124	599.4904	617.3838	637.1081	675.0663	699.4382 (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	
Northeast				7.9300	11.2829		0.4500		0.8000		0.7700	22.3219 (75)
Southeast				9.8300	36.7938		0.4500		0.8000		0.7700	90.2328 (77)
Southwest				3.6600	36.7938		0.4500		0.8000		0.7700	33.5963 (79)
Northwest				11.4500	11.2829		0.4500		0.8000		0.7700	32.2302 (81)
Solar gains	178.3812	321.9692	488.6624	686.1497	842.1796	868.4789	823.8273	702.4702	556.2721	368.8217	216.9594	150.5219 (83)
Total gains	893.5008	1055.7616	1191.5879	1366.5299	1487.9751	1491.8474	1423.4398	1301.9606	1173.6559	1005.9298	892.0257	849.9601 (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	92.3563	92.5910	92.8269	94.0245	94.2677	95.5031	95.5031	95.7540	95.0051	94.2677	93.7825	93.3022
alpha	7.1571	7.1727	7.1885	7.2683	7.2845	7.3669	7.3669	7.3836	7.3337	7.2845	7.2522	7.2201
util living area	0.9988	0.9957	0.9838	0.9185	0.7468	0.5253	0.3799	0.4328	0.7062	0.9597	0.9962	0.9992 (86)
Living	20.3255	20.4486	20.6170	20.8255	20.9329	20.9560	20.9576	20.9575	20.9452	20.7875	20.5194	20.3074
Non living	19.6161	19.7401	19.9075	20.1105	20.1983	20.2216	20.2223	20.2241	20.2126	20.0818	19.8188	19.6042
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	20.6550	20.4486	20.6170	20.8255	20.9329	20.9560	20.9576	20.9575	20.9452	20.7875	20.5194	20.4042 (87)
Th 2	20.2413	20.2431	20.2449	20.2538	20.2556	20.2645	20.2645	20.2663	20.2609	20.2556	20.2520	20.2484 (88)
util rest of house	0.9984	0.9943	0.9782	0.8947	0.6972	0.4660	0.3165	0.3641	0.6391	0.9424	0.9946	0.9989 (89)
MIT 2	19.9214	19.7401	19.9075	20.1105	20.1983	20.2216	20.2223	20.2241	20.2126	20.0818	19.8188	19.6943 (90)
Living area fraction									fLA = Living area / (4) =			0.1384 (91)
MIT	20.0230	19.8382	20.0057	20.2095	20.3000	20.3233	20.3241	20.3256	20.3140	20.1795	19.9158	19.7926 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0230	19.8382	20.0057	20.2095	20.3000	20.3233	20.3241	20.3256	20.3140	20.1795	19.9158	19.7926 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9933	0.9761	0.8931	0.7003	0.4708	0.3217	0.3697	0.6441	0.9403	0.9937	0.9987 (94)
Useful gains	891.9483	1048.6541	1163.0701	1220.4665	1042.0488	702.3168	457.8735	481.2714	755.9299	945.8421	886.3814	848.8139 (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	1999.3197	1894.7085	1708.6710	1412.5917	1071.3913	703.7871	457.9466	481.4674	768.1381	1193.4225	1604.8607	1962.6393 (97)
Space heating kWh	823.8843	568.5486	405.9271	138.3301	21.8308	0.0000	0.0000	0.0000	0.0000	184.1997	517.3051	828.6861 (98a)
Space heating requirement - total per year (kWh/year)												3488.7120
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	823.8843	568.5486	405.9271	138.3301	21.8308	0.0000	0.0000	0.0000	0.0000	184.1997	517.3051	828.6861 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3488.7120
Space heating per m2										(98c) / (4) =		22.3306 (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 %)												262.3932 (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	823.8843	568.5486	405.9271	138.3301	21.8308	0.0000	0.0000	0.0000	0.0000	184.1997	517.3051	828.6861 (98)
Space heating efficiency (main heating system 1)	262.3932	262.3932	262.3932	262.3932	262.3932	0.0000	0.0000	0.0000	0.0000	262.3932	262.3932	262.3932 (210)
Space heating fuel (main heating system)	313.9884	216.6781	154.7018	52.7186	8.3199	0.0000	0.0000	0.0000	0.0000	70.1999	197.1488	315.8184 (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	264.3909	233.8483	248.6539	219.3141	213.0326	192.4505	190.3575	197.6822	199.5793	221.9491	235.2480	261.6083 (64)
Efficiency of water heater	175.9585	175.9585	175.9585	175.9585	175.9585	175.9585	175.9585	175.9585	175.9585	175.9585	175.9585	175.9585 (216)
Fuel for water heating, kWh/month	150.2575	132.8997	141.3140	124.6397	121.0698	109.3727	108.1832	112.3459	113.4241	126.1372	133.6952	148.6762 (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	37.4018	33.7823	37.4018	36.1953	37.4018	36.1953	37.4018	37.4018	36.1953	37.4018	36.1953	37.4018 (231)
Lighting	35.1792	28.2221	25.4108	18.6171	14.3804	11.7489	13.1182	17.0516	22.1483	29.0598	32.8230	36.1569 (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												1329.5738 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.9585
Water heating fuel used												1522.0150 (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)												440.3765 (230a)
Total electricity for the above, kWh/year												440.3765 (231)
Electricity for lighting (calculated in Appendix L)												283.9162 (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	3575.8815 (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	1329.5738	0.1572	208.9500 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1522.0150	0.1408	214.3120 (264)
Space and water heating			423.2620 (265)
Pumps, fans and electric keep-hot	440.3765	0.1387	61.0856 (267)
Energy for lighting	283.9162	0.1443	40.9779 (268)
Total CO2, kg/year			525.3256 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3600 (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	1329.5738	1.5818	2103.0923 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1522.0150	1.5207	2314.4561 (278)
Space and water heating			4417.5484 (279)
Pumps, fans and electric keep-hot	440.3765	1.5128	666.2015 (281)
Energy for lighting	283.9162	1.5338	435.4801 (282)
Total Primary energy kWh/year			5519.2301 (286)
Dwelling Primary energy Rate (DPER)			35.3300 (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	78.5100 (1b)	x 2.6000 (2b)	= 204.1260 (1b) - (3b)
First floor	77.7200 (1c)	x 2.4000 (2c)	= 186.5280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	156.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	390.6540 (5)

2. Ventilation rate

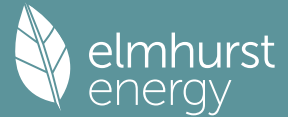
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1024 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3524 (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) = 0.3524 (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	0.4493	0.4405	0.4317	0.3876	0.3788	0.3348	0.3348	0.3260	0.3524	0.3788	0.3964	0.4141 (22b)
Effective ac	0.6009	0.5970	0.5932	0.5751	0.5718	0.5560	0.5560	0.5531	0.5621	0.5718	0.5786	0.5857 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							

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TER Opaque door			2.1600	1.0000	2.1600	(26)
TER Opening Type			32.8700	1.1450	37.6374	(27)
Heatloss Floor 1			78.5100	0.1300	10.2063	(28a)
00 Ext Wall	110.7300	27.1000	83.6300	0.1800	15.0534	(29a)
01 Ext Wall	94.9600	7.9300	87.0300	0.1800	15.6654	(29a)
Roof	77.7200		77.7200	0.1100	8.5492	(30)
Total net area of external elements Aum(A, m2)			361.9200			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	89.2717		(33)

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

270.6148 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	24.8500	0.0500	1.2425
E3 Sill	23.8200	0.0500	1.1910
E4 Jamb	52.6700	0.0500	2.6335
E5 Ground floor (normal)	42.5900	0.1600	6.8144
E6 Intermediate floor within a dwelling	39.5700	0.0000	0.0000
E16 Corner (normal)	15.6000	0.0900	1.4040
E16 Corner (normal)	14.4000	0.0900	1.2960
E17 Corner (inverted - internal area greater than external area)	20.0000	-0.0900	-1.8000

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

12.7814 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 102.0531 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	77.4701	76.9648	76.4695	74.1432	73.7080	71.6819	71.6819	71.3067	72.4623	73.7080	74.5885	75.5090
Heat transfer coeff	179.5232	179.0179	178.5226	176.1964	175.7611	173.7350	173.7350	173.3598	174.5154	175.7611	176.6416	177.5621
Average = Sum(39)m / 12 =						173.7350	173.7350	173.3598	174.5154	175.7611	176.6416	177.5621

176.1943 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1491	1.1459	1.1427	1.1278	1.1250	1.1120	1.1120	1.1096	1.1170	1.1250	1.1307	1.1365
HLP (average)												1.1278
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

1.1365 (40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.9435 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Hot water usage for baths	84.8734	83.6129	81.8379	78.5650	76.1144	73.3970	71.9292	73.6918	75.6110	78.5187	81.8589	84.5865
Hot water usage for other uses	44.7747	43.1465	41.5184	39.8902	38.2620	36.6339	36.6339	38.2620	39.8902	41.5184	43.1465	44.7747
Average daily hot water use (litres/day)												

119.3953 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	129.6481	126.7595	123.3562	118.4552	114.3764	110.0308	108.5630	111.9538	115.5012	120.0370	125.0054	129.3612
Energy conte	205.3309	180.5038	189.5940	162.1593	153.9726	135.2957	131.2976	138.6222	142.4245	162.8891	178.0932	202.5484
Energy content (annual)												

1982.7312 (44)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Distribution loss	30.7996	27.0756	28.4391	24.3239	23.0959	20.2944	19.6946	20.7933	21.3637	24.4334	26.7140	30.3823

30.3823 (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

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

0.0000 (61)

Total heat required for water heating calculated for each month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total heat required	256.2570	226.5015	240.5200	211.4426	204.8987	184.5790	182.2236	189.5483	191.7078	213.8152	227.3765	253.4744
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
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
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
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

0.0000 (63d)

Output from w/h

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Output from w/h	256.2570	226.5015	240.5200	211.4426	204.8987	184.5790	182.2236	189.5483	191.7078	213.8152	227.3765	253.4744
Total per year (kWh/year)												

2582.3447 (64)

12Total per year (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												

0.0000 (64a)

Heat gains from water heating, kWh/month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat gains from water heating	109.0134	96.8157	103.7809	93.3446	91.9368	84.4125	84.3973	86.8327	86.7828	94.9015	98.6426	108.0882

108.0882 (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	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766	147.1766
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	165.4764	183.2060	165.4764	170.9922	165.4764	170.9922	165.4764	165.4764	170.9922	165.4764	170.9922	165.4764
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.2207	330.6163	322.0596	303.8436	280.8491	259.2376	244.7997	241.4042	249.9608	268.1769	291.1713	312.7829

312.7829 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cooking gains	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177	37.7177
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
Losses e.g. evaporation (negative values) (Table 5)	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413	-117.7413

-117.7413 (71)

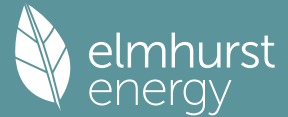
Water heating gains (Table 5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Water heating gains	146.5234	144.0710	139.4904	129.6453	123.5709	117.2395	113.4372	116.7107	120.5316	127.5558	137.0036	145.2798
Total internal gains	709.3735	728.0462	697.1794	674.6341	640.0494	614.6224	590.8663	590.7442	608.6377	631.3620	669.3202	693.6921

693.6921 (73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
Northeast	7.9300				11.2829	0.6300	0.7000	0.7700	27.3443 (75)			
Southeast	9.8300				36.7938	0.6300	0.7000	0.7700	110.5351 (77)			
Southwest	3.6600				36.7938	0.6300	0.7000	0.7700	41.1555 (79)			
Northwest	11.4500				11.2829	0.6300	0.7000	0.7700	39.4820 (81)			
Solar gains	218.5170	394.4123	598.6115	840.5333	1031.6700	1063.8867	1009.1885	860.5260	681.4333	451.8066	265.7753	184.3894 (83)
Total gains	927.8905	1122.4585	1295.7908	1515.1675	1671.7194	1678.5090	1600.0548	1451.2702	1290.0710	1083.1686	935.0955	878.0814 (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	65.4173	65.6020	65.7840	66.6525	66.8176	67.5968	67.5968	67.7431	67.2945	66.8176	66.4845	66.1398
alpha	5.3612	5.3735	5.3856	5.4435	5.4545	5.5065	5.5065	5.5162	5.4863	5.4545	5.4323	5.4093
util living area	0.9987	0.9961	0.9878	0.9493	0.8354	0.6376	0.4734	0.5402	0.8153	0.9757	0.9967	0.9991 (86)
MIT	19.6655	19.8629	20.1560	20.5515	20.8460	20.9729	20.9955	20.9913	20.9013	20.5012	20.0155	19.6404 (87)
Th 2	19.9609	19.9636	19.9661	19.9782	19.9805	19.9910	19.9910	19.9930	19.9869	19.9805	19.9759	19.9711 (88)
util rest of house	0.9982	0.9947	0.9831	0.9299	0.7811	0.5478	0.3672	0.4269	0.7361	0.9628	0.9953	0.9987 (89)
MIT 2	18.4024	18.6566	19.0309	19.5277	19.8563	19.9768	19.9897	19.9902	19.9223	19.4776	18.8615	18.3776 (90)
Living area fraction	fLA = Living area / (4) = 0.1384 (91)											
MIT	18.5773	18.8236	19.1867	19.6695	19.9933	20.1147	20.1290	20.1288	20.0579	19.6193	19.0213	18.5524 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.5773	18.8236	19.1867	19.6695	19.9933	20.1147	20.1290	20.1288	20.0579	19.6193	19.0213	18.5524 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9924	0.9782	0.9227	0.7819	0.5593	0.3820	0.4425	0.7424	0.9566	0.9932	0.9979 (94)
Useful gains	925.3362	1113.9237	1267.5896	1397.9866	1307.0645	938.8435	611.1840	642.2571	957.7228	1036.1731	928.7418	876.2725 (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	2563.1032	2492.5673	2264.8551	1897.5400	1457.6401	958.1027	613.1097	646.4185	1039.7378	1585.2408	2105.7912	2548.4480 (97)
Space heating kWh	1218.4987	926.4485	741.9655	359.6784	112.0282	0.0000	0.0000	0.0000	0.0000	408.5064	847.4756	1244.0986 (98a)
Space heating requirement - total per year (kWh/year)	5858.6998											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000											
Space heating kWh	1218.4987	926.4485	741.9655	359.6784	112.0282	0.0000	0.0000	0.0000	0.0000	408.5064	847.4756	1244.0986 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5858.6998											
Space heating per m2	(98c) / (4) = 37.5005 (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	1218.4987	926.4485	741.9655	359.6784	112.0282	0.0000	0.0000	0.0000	0.0000	408.5064	847.4756	1244.0986 (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)	1320.1502	1003.7362	803.8629	389.6841	121.3740	0.0000	0.0000	0.0000	0.0000	442.5854	918.1751	1347.8858 (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	256.2570	226.5015	240.5200	211.4426	204.8987	184.5790	182.2236	189.5483	191.7078	213.8152	227.3765	253.4744 (64)
Water heating requirement	87.0932	86.8752	86.4141	85.2408	82.7651	79.8000	79.8000	79.8000	79.8000	85.4874	86.7308	79.8000 (216)
Efficiency of water heater (217)m	294.2330	260.7207	278.3342	248.0533	247.5664	231.3021	228.3504	237.5292	240.2353	250.1130	262.1636	290.8931 (219)
Fuel for 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 (221)
Space cooling fuel requirement	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)
(221)m	34.3827	27.5831	24.8355	18.1956	14.0548	11.4829	12.8212	16.6655	21.6469	28.4019	32.0799	35.3383 (232)
Pumps and Fa	-67.8409	-92.9135	-129.7497	-141.5246	-148.9241	-137.5612	-135.6807	-129.7438	-118.9316	-103.9592	-73.5295	-58.9621 (233a)
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 (234a)
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 (235a)
(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 (235a)
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 (235c)
(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 (235c)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	-47.1132	-97.9479	-192.6430	-286.5143	-376.2564	-377.2550	-372.9768	-317.1179	-234.0953	-139.3179	-62.6348	-37.3603 (233b)
(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 (235b)
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)
(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 (235b)
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 (235d)
(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 (235d)
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)
(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)

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Annual totals kWh/year		
Space heating fuel - main system 1	6347.4538	(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	3069.4942	(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)	277.4883	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3880.5536	(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	5899.8827	(238)

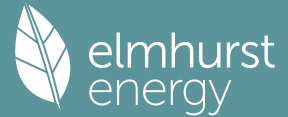
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6347.4538	0.2100	1332.9653 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3069.4942	0.2100	644.5938 (264)
Space and water heating			1977.5591 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	277.4883	0.1443	40.0501 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1339.3209	0.1352	-181.1330
PV Unit electricity exported	-2541.2327	0.1262	-320.6470
Total			-501.7800 (269)
Total CO2, kg/year			1527.7584 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7800 (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	6347.4538	1.1300	7172.6228 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3069.4942	1.1300	3468.5284 (278)
Space and water heating			10641.1512 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	277.4883	1.5338	425.6207 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1339.3209	1.4999	-2008.8067
PV Unit electricity exported	-2541.2327	0.4632	-1177.0255
Total			-3185.8322 (283)
Total Primary energy kWh/year			8011.0405 (286)
Target Primary Energy Rate (TPER)			51.2800 (287)

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Plot Reference	Plot 02				Issued on Date	29/01/2026	
Assessment Reference	Plot 02			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	83 B	DER	3.72	TER	11.47		
Environmental	97 A	% DER < TER				67.57	
CO ₂ Emissions (t/year)	0.37	DFEE	40.62	TFEE	43.56		
Compliance Check	See BREL	% DFEE < TFEE				6.77	
% DPER < TPER	34.54	DPER	39.28	TPER	60.01		
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	55.7200 (1b)	x 2.6000 (2b)	= 144.8720 (1b) - (3b)
First floor	55.7000 (1c)	x 2.4000 (2c)	= 133.6800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 278.5520 (5)

2. Ventilation rate

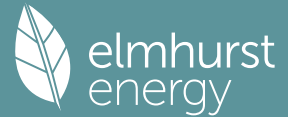
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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			24.2300	0.7752	18.7829		(27)
Front Door			2.1100	1.0000	2.1100		(26)
Heatloss Floor 1			55.7200	0.0700	3.9004	75.0000	4179.0000 (28a)
Ext Wall	168.1600	26.3400	141.8200	0.1400	19.8548	190.0000	26945.8007 (29a)
Roof	55.7200		55.7200	0.0900	5.0148	9.0000	501.4800 (30)
Total net area of external elements Aum(A, m ²)			279.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.6629		(33)
Main dwelling							
00 Internal Wall			94.1200			9.0000	847.0800 (32c)
01 Internal Wall			120.4800			9.0000	1084.3200 (32c)
Internal Floor 1			55.7200			18.0000	1002.9600 (32d)
Ground			55.7200			9.0000	501.4800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	35062.1208 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 314.6843 (35)
Thermal bridges (User defined value 0.100 * total exposed area) 27.9600 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 77.6229 (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
	19.2117	18.9819	18.7521	17.6031	17.3733	16.2243	16.2243	15.9945	16.6839	17.3733	17.8329	18.2925
Heat transfer coeff	96.8347	96.6049	96.3751	95.2260	94.9962	93.8472	93.8472	93.6174	94.3068	94.9962	95.4558	95.9155
Average = Sum(39)m / 12 =												95.1686
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8691	0.8670	0.8650	0.8547	0.8526	0.8423	0.8423	0.8402	0.8464	0.8526	0.8567	0.8608
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8231
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												
82.5352	81.3095	79.5833	76.4007	74.0175	71.3750	69.9476	71.6617	73.5280	76.3556	79.6038	82.2562	(42b)
Hot water usage for other uses												
43.5412	41.9579	40.3746	38.7913	37.2080	35.6246	35.6246	37.2080	38.7913	40.3746	41.9579	43.5412	(42c)
Average daily hot water use (litres/day)												116.1061
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	126.0765	123.2674	119.9579	115.1919	111.2255	106.9996	105.5722	108.8696	112.3192	116.7302	121.5617	125.7974
Energy conte	199.6743	175.5311	184.3709	157.6920	149.7308	131.5685	127.6805	134.8033	138.5008	158.4017	173.1869	196.9684
Energy content (annual)												(44)
Distribution loss (46)m = 0.15 x (45)m												
29.9511	26.3297	27.6556	23.6538	22.4596	19.7353	19.1521	20.2205	20.7751	23.7603	25.9780	29.5453	(45)
Water storage loss (or HIU loss):												200.0000
Store volume												(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3000
Temperature factor from Table 2b												(48)
Enter (49) or (54) in (55)												0.5400
Total storage loss												(49)
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
If cylinder contains dedicated solar storage												(56)
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
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
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Total heat required for water heating calculated for each month												(59)
258.7342	228.8756	243.4308	214.8468	208.7908	188.7233	186.7404	193.8633	195.6556	217.4617	230.3417	256.0283	(61)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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
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
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
Output from w/h												(63a)
258.7342	228.8756	243.4308	214.8468	208.7908	188.7233	186.7404	193.8633	195.6556	217.4617	230.3417	256.0283	(63b)
12Total per year (kWh/year)												2623.4926
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	0.0000
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month												(64a)
113.6397	101.0397	108.5513	98.1564	97.0335	89.4704	89.7017	92.0701	91.7754	99.9165	103.3085	112.7400	(64b)

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
141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
138.0965	152.8926	138.0965	142.6998	138.0965	142.6998	138.0965	142.6998	138.0965	142.6998	138.0965	142.6998	138.0965
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
273.5806	276.4195	269.2655	254.0356	234.8105	216.7417	204.6706	201.8317	208.9856	224.2156	243.4406	261.5095	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)												
-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234
Water heating gains (Table 5)												
152.7415	150.3567	145.9023	136.3284	130.4213	124.2644	120.5668	123.7501	127.4658	134.2964	143.4840	151.5322	(68)
Total internal gains												
629.7649	645.0150	618.6106	598.4100	568.6747	549.0521	528.6802	529.0246	544.4975	561.9548	594.9707	616.4845	(69)

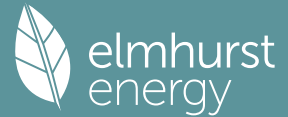
6. Solar gains

[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				11.6900	10.6334	0.4500		0.8000			0.7700			31.0114 (74)
South				8.9200	46.7521	0.4500		0.8000			0.7700			104.0403 (78)
West				3.6200	19.6403	0.4500		0.8000			0.7700			17.7375 (80)
Solar gains	152.7892	264.3538	374.8960	490.4090	575.6682	583.8343	557.6940	491.7190	414.2719	295.5018	183.6963	130.3395 (83)		
Total gains	782.5541	909.3689	993.5066	1088.8190	1144.3429	1132.8864	1086.3742	1020.7436	958.7694	857.4566	778.6670	746.8240 (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	100.5784	100.8177	101.0581	102.2775	102.5249	103.7802	103.7802	104.0349	103.2744	102.5249	102.0312	101.5423
alpha	7.7052	7.7212	7.7372	7.8185	7.8350	7.9187	7.9187	7.9357	7.8850	7.8350	7.8021	7.7695
util living area	0.9981	0.9934	0.9783	0.9100	0.7462	0.5285	0.3800	0.4216	0.6681	0.9390	0.9935	0.9986 (86)
Living	20.4365	20.5516	20.6934	20.8590	20.9418	20.9595	20.9606	20.9606	20.9541	20.8456	20.6133	20.4177
Non living	19.6789	19.7944	19.9341	20.0932	20.1580	20.1771	20.1775	20.1794	20.1712	20.0865	19.8639	19.6664
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	20.7118	20.5516	20.6934	20.8590	20.9418	20.9595	20.9606	20.9606	20.9541	20.8456	20.6133	20.4992 (87)
Th 2	20.1938	20.1956	20.1974	20.2062	20.2080	20.2168	20.2168	20.2186	20.2133	20.2080	20.2044	20.2009 (88)
util rest of house	0.9973	0.9908	0.9701	0.8816	0.6920	0.4647	0.3124	0.3502	0.5969	0.9125	0.9905	0.9981 (89)
MIT 2	19.9304	19.7944	19.9341	20.0932	20.1580	20.1771	20.1775	20.1794	20.1712	20.0865	19.8639	19.7412 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.0347	19.8956	20.0355	20.1954	20.2627	20.2816	20.2821	20.2837	20.2757	20.1879	19.9640	19.8424 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0347	19.8956	20.0355	20.1954	20.2627	20.2816	20.2821	20.2837	20.2757	20.1879	19.9640	19.8424 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9896	0.9681	0.8811	0.6959	0.4700	0.3181	0.3561	0.6027	0.9117	0.9893	0.9978 (94)
Useful gains	780.3044	899.9120	961.7667	959.3815	796.3679	532.4792	345.5274	363.5158	577.8708	781.7334	770.3651	745.1600 (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	1523.6689	1448.6449	1304.4838	1075.6206	813.4228	533.2027	345.5545	363.5806	582.4142	910.8141	1227.9428	1500.3466 (97)
Space heating kWh	553.0632	368.7485	254.9815	83.6922	12.6889	0.0000	0.0000	0.0000	0.0000	96.0361	329.4560	561.8588 (98a)
Space heating requirement - total per year (kWh/year)												2260.5251
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	553.0632	368.7485	254.9815	83.6922	12.6889	0.0000	0.0000	0.0000	0.0000	96.0361	329.4560	561.8588 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2260.5251
Space heating per m2										(98c) / (4) =		20.2883 (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 %)												273.2697 (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	553.0632	368.7485	254.9815	83.6922	12.6889	0.0000	0.0000	0.0000	0.0000	96.0361	329.4560	561.8588 (98)
Space heating efficiency (main heating system 1)	273.2697	273.2697	273.2697	273.2697	273.2697	0.0000	0.0000	0.0000	0.0000	273.2697	273.2697	273.2697 (210)
Space heating fuel (main heating system)	202.3873	134.9394	93.3076	30.6262	4.6434	0.0000	0.0000	0.0000	0.0000	35.1433	120.5607	205.6059 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	258.7342	228.8756	243.4308	214.8468	208.7908	188.7233	186.7404	193.8633	195.6556	217.4617	230.3417	256.0283 (64)
Efficiency of water heater	178.9915	178.9915	178.9915	178.9915	178.9915	178.9915	178.9915	178.9915	178.9915	178.9915	178.9915	178.9915 (216)
Fuel for water heating, kWh/month	144.5511	127.8695	136.0013	120.0318	116.6484	105.4370	104.3292	108.3086	109.3100	121.4927	128.6886	143.0394 (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	26.6690	24.0881	26.6690	25.8087	26.6690	25.8087	26.6690	26.6690	25.8087	26.6690	25.8087	26.6690 (231)
Lighting	29.3584	23.5524	21.2063	15.5367	12.0010	9.8049	10.9477	14.2302	18.4836	24.2515	27.3921	30.1744 (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												827.2139 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												178.9915
Water heating fuel used												1465.7078 (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)												314.0061 (230a)
Total electricity for the above, kWh/year												314.0061 (231)
Electricity for lighting (calculated in Appendix L)												236.9393 (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	2843.8670 (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	827.2139	0.1576	130.3459 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1465.7078	0.1408	206.3611 (264)
Space and water heating			336.7070 (265)
Pumps, fans and electric keep-hot	314.0061	0.1387	43.5565 (267)
Energy for lighting	236.9393	0.1443	34.1977 (268)
Total CO2, kg/year			414.4612 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7200 (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	827.2139	1.5833	1309.7332 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1465.7078	1.5206	2228.7483 (278)
Space and water heating			3538.4815 (279)
Pumps, fans and electric keep-hot	314.0061	1.5128	475.0284 (281)
Energy for lighting	236.9393	1.5338	363.4253 (282)
Total Primary energy kWh/year			4376.9352 (286)
Dwelling Primary energy Rate (DPER)			39.2800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	55.7200 (1b)	x 2.6000 (2b)	= 144.8720 (1b) - (3b)
First floor	55.7000 (1c)	x 2.4000 (2c)	= 133.6800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 278.5520 (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)

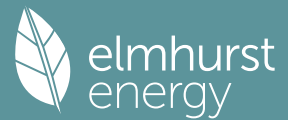
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1436 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3936 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3936 (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	0.5018	0.4920	0.4822	0.4330	0.4231	0.3739	0.3739	0.3641	0.3936	0.4231	0.4428	0.4625 (22b)
Effective ac	0.6259	0.6210	0.6162	0.5937	0.5895	0.5699	0.5699	0.5663	0.5775	0.5895	0.5980	0.6069 (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			2.1100	1.0000	2.1100		(26)
TER Opening Type			24.2300	1.1450	27.7443		(27)

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Heatloss Floor 1				55.7200	0.1300	7.2436	(28a)
Ext Wall	168.1600	26.3400		141.8200	0.1800	25.5276	(29a)
Roof	55.7200			55.7200	0.1100	6.1292	(30)
Total net area of external elements Aum(A, m2)				279.6000			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		68.7547	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 314.6843 (35)

List of Thermal Bridges													
K1 Element													
E1 Steel lintel with perforated steel base plate													
E3 Sill													
E4 Jamb													
E5 Ground floor (normal)													
E6 Intermediate floor within a dwelling													
E16 Corner (normal)													
E16 Corner (normal)													
E17 Corner (inverted - internal area greater than external area)													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													12.7814 (36)
Point Thermal bridges													0.0000 (36a) =
Total fabric heat loss													(33) + (36) + (36a) = 81.5361 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	57.5361	57.0866	56.6460	54.5767	54.1895	52.3872	52.3872	52.0534	53.0814	54.1895	54.9727	55.7916	(38)
Heat transfer coeff	139.0721	138.6227	138.1821	136.1128	135.7256	133.9233	133.9233	133.5895	134.6175	135.7256	136.5088	137.3277	(39)
Average = Sum(39)m / 12 =												136.1109	
HLP	1.2482	1.2441	1.2402	1.2216	1.2181	1.2020	1.2020	1.1990	1.2082	1.2181	1.2252	1.2325	(40)
HLP (average)												1.2216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8231 (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													
82.5352	81.3095	79.5833	76.4007	74.0175	71.3750	69.9476	71.6617	73.5280	76.3556	79.6038	82.2562	82.2562	(42b)
Hot water usage for other uses													
43.5412	41.9579	40.3746	38.7913	37.2080	35.6246	35.6246	37.2080	38.7913	40.3746	41.9579	43.5412	43.5412	(42c)
Average daily hot water use (litres/day)												116.1061	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	126.0765	123.2674	119.9579	115.1919	111.2255	106.9996	105.5722	108.8696	112.3192	116.7302	121.5617	125.7974	(44)
Energy conte	199.6743	175.5311	184.3709	157.6920	149.7308	131.5685	127.6805	134.8033	138.5008	158.4017	173.1869	196.9684	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
29.9511	26.3297	27.6556	23.6538	22.4596	19.7353	19.1521	20.2205	20.7751	23.7603	25.9780	29.5453	29.5453	(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													
250.6004	221.5288	235.2969	206.9753	200.6569	180.8518	178.6065	185.7294	187.7841	209.3278	222.4702	247.8944	247.8944	(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													
250.6004	221.5288	235.2969	206.9753	200.6569	180.8518	178.6065	185.7294	187.7841	209.3278	222.4702	247.8944	247.8944	(64)
Total per year (kWh/year)												2527.7227	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
107.1326	95.1623	102.0442	91.8592	90.5264	83.1732	83.1946	85.5630	85.4782	93.4094	97.0113	106.2328	106.2328	(65)

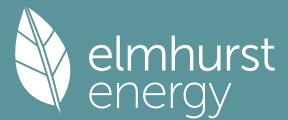
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	141.1543	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
138.0965	152.8926	138.0965	142.6998	138.0965	142.6998	138.0965	138.0965	142.6998	138.0965	142.6998	138.0965	138.0965	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
273.5806	276.4195	269.2655	254.0356	234.8105	216.7417	204.6706	201.8317	208.9856	224.2156	243.4406	261.5095	261.5095	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	37.1154	(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)													
-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	-112.9234	(71)
Water heating gains (Table 5)													
143.9954	141.6105	137.1561	127.5823	121.6752	115.5183	111.8207	115.0040	118.7197	125.5503	134.7379	142.7861	142.7861	(72)
Total internal gains													
624.0188	639.2689	612.8645	592.6639	562.9286	540.3060	519.9341	520.2785	535.7514	556.2087	589.2246	610.7384	610.7384	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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	W/m2			or Table 6b			or Table 6c			Table 6d		
North			11.6900		10.6334	0.6300		0.7000		0.7700		37.9890 (74)
South			8.9200		46.7521	0.6300		0.7000		0.7700		127.4493 (78)
West			3.6200		19.6403	0.6300		0.7000		0.7700		21.7284 (80)

Solar gains	187.1667	323.8335	459.2475	600.7510	705.1936	715.1970	683.1751	602.3557	507.4831	361.9897	225.0280	159.6658 (83)
Total gains	811.1855	963.1024	1072.1120	1193.4149	1268.1221	1255.5030	1203.1093	1122.6342	1043.2344	918.1984	814.2526	770.4042 (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	70.0318	70.2589	70.4829	71.5545	71.7586	72.7243	72.7243	72.9060	72.3493	71.7586	71.3469	70.9215
alpha	5.6688	5.6839	5.6989	5.7703	5.7839	5.8483	5.8483	5.8604	5.8233	5.7839	5.7565	5.7281
util living area	0.9983	0.9952	0.9866	0.9516	0.8506	0.6576	0.4859	0.5400	0.7997	0.9693	0.9956	0.9988 (86)
MIT	19.8095	19.9972	20.2547	20.5960	20.8549	20.9751	20.9963	20.9934	20.9251	20.5877	20.1417	19.7870 (87)
Th 2	19.8817	19.8848	19.8880	19.9027	19.9055	19.9184	19.9184	19.9208	19.9134	19.9055	19.8999	19.8941 (88)
util rest of house	0.9976	0.9932	0.9807	0.9302	0.7920	0.5582	0.3687	0.4175	0.7093	0.9512	0.9934	0.9982 (89)
MIT 2	18.5105	18.7523	19.0806	19.5098	19.7946	19.9068	19.9176	19.9191	19.8701	19.5103	18.9489	18.4909 (90)
Living area fraction												0.1335 (91)
MIT	18.6839	18.9186	19.2374	19.6549	19.9362	20.0495	20.0616	20.0626	20.0110	19.6542	19.1082	18.6639 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6839	18.9186	19.2374	19.6549	19.9362	20.0495	20.0616	20.0626	20.0110	19.6542	19.1082	18.6639 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9906	0.9760	0.9241	0.7939	0.5708	0.3844	0.4339	0.7184	0.9456	0.9910	0.9973 (94)
Useful gains	808.2870	954.0323	1046.3288	1102.8599	1006.7874	716.6902	462.5152	487.1525	749.4317	868.2662	806.8880	768.3236 (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	2000.4047	1943.2932	1760.0765	1463.8783	1117.8685	729.8099	463.5948	489.2841	795.7233	1228.8818	1639.2250	1986.2998 (97)
Space heating kWh	886.9355	664.7833	531.0283	259.9332	82.6443	0.0000	0.0000	0.0000	0.0000	268.2980	599.2827	906.1743 (98a)
Space heating requirement - total per year (kWh/year)												4199.0797
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	886.9355	664.7833	531.0283	259.9332	82.6443	0.0000	0.0000	0.0000	0.0000	268.2980	599.2827	906.1743 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4199.0797
Space heating per m2										(98c) / (4) =		37.6869 (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	886.9355	664.7833	531.0283	259.9332	82.6443	0.0000	0.0000	0.0000	0.0000	268.2980	599.2827	906.1743 (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)	960.9269	720.2419	575.3286	281.6178	89.5388	0.0000	0.0000	0.0000	0.0000	290.6804	649.2770	981.7706 (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	250.6004	221.5288	235.2969	206.9753	200.6569	180.8518	178.6065	185.7294	187.7841	209.3278	222.4702	247.8944 (64)
Efficiency of water heater (217)m	86.6472	86.3654	85.8278	84.5718	82.2313	79.8000	79.8000	79.8000	79.8000	84.6175	86.1690	79.8000 (216)
Fuel for water heating, kWh/month	289.2193	256.5018	274.1499	244.7331	244.0154	226.6313	223.8177	232.7436	235.3185	247.3813	258.1789	285.9232 (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	7.0685	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	28.6937	23.0192	20.7262	15.1849	11.7293	9.5829	10.6998	13.9080	18.0652	23.7025	26.7719	29.4912 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-50.3682	-70.1282	-99.5556	-110.4815	-117.8793	-109.5195	-108.0846	-102.5907	-92.7928	-79.4148	-55.0265	-43.6435 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-31.2169	-65.3296	-129.2525	-193.3056	-254.8510	-255.8550	-252.9190	-214.5554	-157.7569	-93.2435	-41.6119	-24.7182 (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												4549.3821 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	79.8000	
Water heating fuel used	3018.6141	(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)	231.5749	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2754.1007	(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	5131.4704	(238)

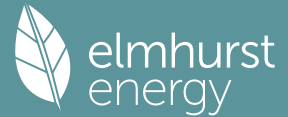
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4549.3821	0.2100	955.3702 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3018.6141	0.2100	633.9090 (264)
Space and water heating			1589.2792 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	231.5749	0.1443	33.4234 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1039.4850	0.1349	-140.1954
PV Unit electricity exported	-1714.6156	0.1260	-216.0675
Total			-356.2628 (269)
Total CO2, kg/year			1278.3690 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4549.3821	1.1300	5140.8018 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3018.6141	1.1300	3411.0339 (278)
Space and water heating			8551.8357 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	231.5749	1.5338	355.1973 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1039.4850	1.4985	-1557.6399
PV Unit electricity exported	-1714.6156	0.4626	-793.1246
Total			-2350.7645 (283)
Total Primary energy kWh/year			6686.3692 (286)
Target Primary Energy Rate (TPER)			60.0100 (287)

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Plot Reference	Plot 10				Issued on Date	29/01/2026	
Assessment Reference	Plot 10			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	82 B	DER	3.70	TER	10.95		
Environmental	96 A	% DER < TER				66.21	
CO ₂ Emissions (t/year)	0.45	DFEE	43.04	TFEE	43.67		
Compliance Check	See BREL	% DFEE < TFEE				1.45	
% DPER < TPER	32.10	DPER	38.99	TPER	57.42		
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	63.7700 (1b)	x 2.6000 (2b)	= 165.8020 (1b) - (3b)
First floor	72.9700 (1c)	x 2.4000 (2c)	= 175.1280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	136.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	340.9300 (5)

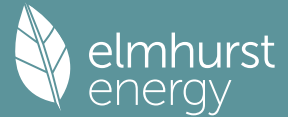
2. Ventilation rate

	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) =	82.8000 (23c)
Effective ac	0.2135 0.2110 0.2085 0.1960 0.1935 0.1810 0.1810 0.1785 0.1860 0.1935 0.1985 0.2035 (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			21.2600	0.7752	16.4806		(27)
Front Door			2.1100	1.0000	2.1100		(26)
Heatloss Floor 1			63.7700	0.0700	4.4639	75.0000	4782.7500 (28a)
Ext Wall	171.4600	23.3700	148.0900	0.1300	19.2517	190.0000	28137.1013 (29a)
External Wall Garage	74.2300		74.2300	0.1200	8.9076	190.0000	14103.7006 (29a)
Roof	72.9700		72.9700	0.0600	4.3782	9.0000	656.7300 (30)
Total net area of external elements A _{um} (A, m ²)			382.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.5920		(33)
Main dwelling							
00 Internal Wall			80.6000			9.0000	725.4000 (32c)
01 Internal Wall			114.9100			9.0000	1034.1900 (32c)
Internal Floor 1			63.7700			18.0000	1147.8600 (32d)
Ground			63.7700			9.0000	573.9300 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 51161.6619 (34)
 Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 374.1529 (35)
 Thermal bridges (User defined value 0.100 * total exposed area) 38.2430 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 93.8350 (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	24.0202	23.7390	23.4577	22.0514	21.7701	20.3637	20.3637	20.0825	20.9263	21.7701	22.3326	22.8952 (38)
Average = $\text{Sum}(39)\text{m} / 12 =$	117.8552	117.5740	117.2927	115.8864	115.6051	114.1988	114.1988	113.9175	114.7613	115.6051	116.1676	116.7302 (39)
												115.8161
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8619	0.8598	0.8578	0.8475	0.8454	0.8352	0.8352	0.8331	0.8393	0.8454	0.8496	0.8537 (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	2.9106 (42)											
Hot water usage for mixer showers	0.0000 (42a)											
Hot water usage for baths	84.2342 (42b)											
Hot water usage for other uses	44.4375 (42c)											
Average daily hot water use (litres/day)	118.4961 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	128.6717	125.8048	122.4272	117.5631	113.5150	109.2022	107.7454	111.1107	114.6313	119.1330	124.0640	128.3869 (44)
Energy content (annual)	203.7845	179.1444	188.1661	160.9381	152.8130	134.2768	130.3088	137.5782	141.3519	161.6624	176.7519	201.0229 (45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	Total = $\text{Sum}(45)\text{m} = 1967.7990$											
Water storage loss (or HIU loss):	30.5677	26.8717	28.2249	24.1407	22.9220	20.1415	19.5463	20.6367	21.2028	24.2494	26.5128	30.1534 (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	262.8445	232.4889	247.2261	218.0929	211.8730	191.4316	189.3687	196.6382	198.5067	220.7223	233.9067	260.0829 (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	262.8445	232.4889	247.2261	218.0929	211.8730	191.4316	189.3687	196.6382	198.5067	220.7223	233.9067	260.0829 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = $\text{Sum}(64)\text{m} = 2663.1824$ (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	115.0063	102.2411	109.8132	99.2357	98.0583	90.3709	90.5756	92.9927	92.7233	101.0007	104.4939	114.0881 (65)

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

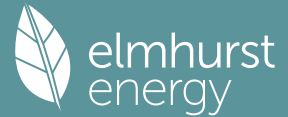
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	161.7772	179.1105	161.7772	167.1698	161.7772	167.1698	161.7772	161.7772	167.1698	161.7772	167.1698	161.7772 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.6739	308.8459	300.8527	283.8361	262.3558	242.1673	228.6802	225.5083	233.5014	250.5180	271.9983	292.1868 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242 (71)
Water heating gains (Table 5)	154.5784	152.1445	147.5984	137.8274	131.7988	125.5151	121.7414	124.9902	128.7824	135.7536	145.1304	153.3442 (72)
Total internal gains	688.6886	706.7599	676.8874	655.4924	622.5909	601.5113	578.8579	578.9348	596.1127	614.7079	650.9575	673.9673 (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				6.6200	10.6334	0.4500		0.8000		0.7700	17.5617 (74)	
South				12.3700	46.7521	0.4500		0.8000		0.7700	144.2800 (78)	
West				2.2700	19.6403	0.4500		0.8000		0.7700	11.1227 (80)	
Solar gains	172.9644	291.6130	393.8576	484.0536	541.9438	538.8215	519.0835	475.1771	424.6679	320.6330	206.5543	148.4582 (83)
Total gains	861.6530	998.3730	1070.7449	1139.5461	1164.5347	1140.3328	1097.9414	1054.1119	1020.7807	935.3410	857.5118	822.4255 (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	120.5850	120.8735	121.1633	122.6337	122.9320	124.4459	124.4459	124.7532	123.8359	122.9320	122.3368	121.7472
alpha	9.0390	9.0582	9.0776	9.1756	9.1955	9.2964	9.2964	9.3169	9.2557	9.1955	9.1558	9.1165
util living area	0.9997	0.9986	0.9944	0.9682	0.8622	0.6372	0.4575	0.4967	0.7578	0.9761	0.9986	0.9998 (86)
Living	20.4799	20.5724	20.6865	20.8346	20.9349	20.9646	20.9664	20.9664	20.9583	20.8389	20.6326	20.4656
Non living	19.7212	19.8150	19.9297	20.0792	20.1628	20.1889	20.1894	20.1913	20.1827	20.0867	19.8832	19.7133
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	20.7340	20.5724	20.6865	20.8346	20.9349	20.9646	20.9664	20.9664	20.9583	20.8389	20.6326	20.5404 (87)
Th 2	20.2000	20.2018	20.2035	20.2124	20.2141	20.2230	20.2230	20.2247	20.2194	20.2141	20.2106	20.2071 (88)
util rest of house	0.9995	0.9978	0.9915	0.9524	0.8112	0.5619	0.3768	0.4133	0.6811	0.9608	0.9977	0.9997 (89)
MIT 2	19.9551	19.8150	19.9297	20.0792	20.1628	20.1889	20.1894	20.1913	20.1827	20.0867	19.8832	19.7824 (90)
Living area fraction										FLA = Living area / (4) =		0.1172 (91)
MIT	20.0463	19.9038	20.0183	20.1677	20.2533	20.2797	20.2805	20.2821	20.2735	20.1748	19.9710	19.8712 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0463	19.9038	20.0183	20.1677	20.2533	20.2797	20.2805	20.2821	20.2735	20.1748	19.9710	19.8712 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9995	0.9975	0.9906	0.9513	0.8140	0.5675	0.3828	0.4195	0.6867	0.9598	0.9974	0.9996 (94)
Useful gains	861.2035	995.8675	1060.7041	1084.0833	947.9395	647.1400	420.2695	442.1573	700.9258	897.7817	855.2526	822.1159 (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	1855.7890	1764.0513	1585.6016	1305.7749	988.8029	648.6190	420.3039	442.2358	708.4831	1106.8971	1495.1962	1829.2985 (97)
Space heating kWh	739.9716	516.2195	390.5237	159.6180	30.4024	0.0000	0.0000	0.0000	0.0000	155.5819	460.7594	749.3438 (98a)
Space heating requirement - total per year (kWh/year)												3202.4203
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	739.9716	516.2195	390.5237	159.6180	30.4024	0.0000	0.0000	0.0000	0.0000	155.5819	460.7594	749.3438 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3202.4203
Space heating per m2										(98c) / (4) =		23.4198 (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 %)												264.2549 (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	739.9716	516.2195	390.5237	159.6180	30.4024	0.0000	0.0000	0.0000	0.0000	155.5819	460.7594	749.3438 (98)
Space heating efficiency (main heating system 1)	264.2549	264.2549	264.2549	264.2549	264.2549	0.0000	0.0000	0.0000	0.0000	264.2549	264.2549	264.2549 (210)
Space heating fuel (main heating system)	280.0219	195.3490	147.7829	60.4030	11.5050	0.0000	0.0000	0.0000	0.0000	58.8757	174.3617	283.5685 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	262.8445	232.4889	247.2261	218.0929	211.8730	191.4316	189.3687	196.6382	198.5067	220.7223	233.9067	260.0829 (64)
Efficiency of water heater (217)m	176.5451	176.5451	176.5451	176.5451	176.5451	176.5451	176.5451	176.5451	176.5451	176.5451	176.5451	176.5451 (216)
Fuel for water heating, kWh/month	148.8824	131.6881	140.0356	123.5338	120.0107	108.4321	107.2636	111.3813	112.4396	125.0232	132.4912	147.3181 (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	39.0705	35.2895	39.0705	37.8102	39.0705	37.8102	39.0705	39.0705	37.8102	39.0705	37.8102	39.0705 (231)
Lighting	34.3928	27.5912	24.8428	18.2009	14.0589	11.4862	12.8250	16.6704	21.6532	28.4102	32.0892	35.3487 (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												1211.8677 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.5451
Water heating fuel used												1508.4997 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1060)												
mechanical ventilation fans (SFP = 1.1060)												460.0237 (230a)
Total electricity for the above, kWh/year												460.0237 (231)
Electricity for lighting (calculated in Appendix L)												277.5694 (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	3457.9604 (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	1211.8677	0.1570	190.2239 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1508.4997	0.1408	212.4027 (264)
Space and water heating			402.6266 (265)
Pumps, fans and electric keep-hot	460.0237	0.1387	63.8110 (267)
Energy for lighting	277.5694	0.1443	40.0618 (268)
Total CO2, kg/year			506.4994 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7000 (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	1211.8677	1.5811	1916.0826 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1508.4997	1.5206	2293.8807 (278)
Space and water heating			4209.9633 (279)
Pumps, fans and electric keep-hot	460.0237	1.5128	695.9238 (281)
Energy for lighting	277.5694	1.5338	425.7452 (282)
Total Primary energy kWh/year			5331.6323 (286)
Dwelling Primary energy Rate (DPER)			38.9900 (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	63.7700 (1b)	x 2.6000 (2b)	= 165.8020 (1b) - (3b)
First floor	72.9700 (1c)	x 2.4000 (2c)	= 175.1280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	136.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 340.9300 (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)

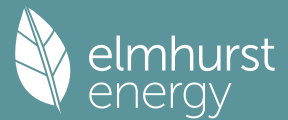
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1173 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3673	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3673 (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	0.4683	0.4592	0.4500	0.4041	0.3949	0.3490	0.3490	0.3398	0.3673	0.3949	0.4132	0.4316 (22b)
Effective ac	0.6097	0.6054	0.6012	0.5816	0.5780	0.5609	0.5609	0.5577	0.5675	0.5780	0.5854	0.5931 (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			2.1100	1.0000	2.1100		(26)

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TER Opening Type			21.2600	1.1450	24.3435	(27)
Heatloss Floor 1			63.7700	0.1300	8.2901	(28a)
Ext Wall	171.4600	23.3700	148.0900	0.1800	26.6562	(29a)
External Wall Garage	74.2300		74.2300	0.1800	13.3614	(29a)
Roof	72.9700		72.9700	0.1100	8.0267	(30)
Total net area of external elements Aum(A, m2)			382.4300			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	82.7879		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 374.1529 (35)

List of Thermal Bridges						
K1 Element			Length	Psi-value	Total	
E16 Corner (normal)			23.4000	0.0900	2.1060	
E17 Corner (inverted - internal area greater than external area)			14.4000	-0.0900	-1.2960	
E1 Steel lintel with perforated steel base plate			18.8600	0.0500	0.9430	
E3 Sill			17.8300	0.0500	0.8915	
E4 Jamb			38.4000	0.0500	1.9200	
E5 Ground floor (normal)			38.9000	0.1600	6.2240	
E6 Intermediate floor within a dwelling			40.5200	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7885 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 93.5764 (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	68.5923	68.1131	67.6435	65.4376	65.0249	63.1036	63.1036	62.7478	63.8436	65.0249	65.8598	66.7327	(38)
Average = Sum(39)m / 12 =	162.1687	161.6895	161.2199	159.0140	158.6013	156.6800	156.6800	156.3242	157.4201	158.6013	159.4362	160.3091	(39)
												159.0120	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1860	1.1825	1.1790	1.1629	1.1599	1.1458	1.1458	1.1432	1.1512	1.1599	1.1660	1.1724	(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													2.9106 (42)
Hot water usage for mixer showers													
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	84.2342	82.9832	81.2215	77.9734	75.5411	72.8442	71.3875	73.1368	75.0415	77.9273	81.2424	83.9494	(42b)
Average daily hot water use (litres/day)	44.4375	42.8216	41.2057	39.5898	37.9739	36.3580	36.3580	37.9739	39.5898	41.2057	42.8216	44.4375	(42c)
												118.4961	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	128.6717	125.8048	122.4272	117.5631	113.5150	109.2022	107.7454	111.1107	114.6313	119.1330	124.0640	128.3869	(44)
Energy content (annual)	203.7845	179.1444	188.1661	160.9381	152.8130	134.2768	130.3088	137.5782	141.3519	161.6624	176.7519	201.0229	(45)
Distribution loss (46)m = 0.15 x (45)m	30.5677	26.8717	28.2249	24.1407	22.9220	20.1415	19.5463	20.6367	21.2028	24.2494	26.5128	30.1534	(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 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 27.6637 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 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 0.0000 (61)

Total heat required for water heating calculated for each month 254.7106 225.1421 239.0922 210.2213 203.7391 183.5601 181.2348 188.5043 190.6351 212.5885 226.0352 251.9490 (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 254.7106 225.1421 239.0922 210.2213 203.7391 183.5601 181.2348 188.5043 190.6351 212.5885 226.0352 251.9490 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2567.4124 (64)

Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 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 108.4992 96.3637 103.3061 92.9385 91.5512 84.0737 84.0685 86.4856 86.4261 94.4936 98.1967 107.5810 (65)

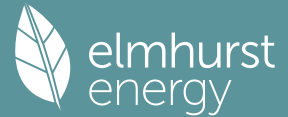
5. Internal gains (see Table 5 and 5a)

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	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	145.5303	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.7772	179.1105	161.7772	167.1698	161.7772	167.1698	161.7772	161.7772	167.1698	161.7772	167.1698	161.7772	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	305.6739	308.8459	300.8527	283.8361	262.3558	242.1673	228.6802	225.5083	233.5014	250.5180	271.9983	292.1868	(68)
Pumps, fans	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	37.5530	(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)	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	-116.4242	(71)
Total internal gains	145.8323	143.3984	138.8523	129.0813	123.0527	116.7690	112.9953	116.2441	120.0363	127.0075	136.3842	144.5981	(72)
	682.9425	701.0138	671.1412	649.7463	616.8448	592.7652	570.1118	570.1887	587.3666	608.9618	645.2114	668.2212	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	6.6200	10.6334	0.6300	0.7000	0.7700	21.5130 (74)
South	12.3700	46.7521	0.6300	0.7000	0.7700	176.7430 (78)
West	2.2700	19.6403	0.6300	0.7000	0.7700	13.6253 (80)

Solar gains	211.8813	357.2260	482.4755	592.9657	663.8812	660.0564	635.8773	582.0920	520.2182	392.7755	253.0290	181.8613	(83)
Total gains	894.8238	1058.2398	1153.6168	1242.7120	1280.7260	1252.8216	1205.9891	1152.2807	1107.5848	1001.7373	898.2404	850.0825	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	87.6345	87.8942	88.1502	89.3731	89.6057	90.7044	90.7044	90.9109	90.2780	89.6057	89.1364	88.6511	
alpha	6.8423	6.8596	6.8767	6.9582	6.9737	7.0470	7.0470	7.0607	7.0185	6.9737	6.9424	6.9101	
util living area	0.9997	0.9988	0.9960	0.9826	0.9272	0.7605	0.5668	0.6155	0.8666	0.9876	0.9989	0.9998	(86)
MIT	19.9838	20.1332	20.3334	20.6049	20.8384	20.9718	20.9967	20.9944	20.9289	20.6289	20.2591	19.9653	(87)
Th 2	19.9312	19.9341	19.9368	19.9498	19.9522	19.9636	19.9636	19.9657	19.9592	19.9522	19.9473	19.9422	(88)
util rest of house	0.9995	0.9981	0.9938	0.9719	0.8839	0.6570	0.4363	0.4823	0.7827	0.9780	0.9982	0.9996	(89)
MIT 2	18.7517	18.9453	19.2029	19.5537	19.8247	19.9511	19.9630	19.9645	19.9191	19.5890	19.1171	18.7366	(90)
Living area fraction	FLA = Living area / (4) =												0.1172 (91)
MIT	18.8961	19.0845	19.3354	19.6769	19.9434	20.0707	20.0841	20.0851	20.0374	19.7108	19.2509	18.8805	(92)
Temperature adjustment	0.0000												0.0000
adjusted MIT	18.8961	19.0845	19.3354	19.6769	19.9434	20.0707	20.0841	20.0851	20.0374	19.7108	19.2509	18.8805	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9992	0.9973	0.9920	0.9682	0.8834	0.6685	0.4517	0.4981	0.7901	0.9748	0.9974	0.9994	(94)
Useful gains	894.1076	1055.4044	1144.3421	1203.1391	1131.4200	837.5617	544.7615	573.9095	875.0540	976.5022	895.9155	849.6049	(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	2367.0261	2293.4806	2069.3194	1713.6723	1307.4186	857.1458	545.8842	576.0736	934.6705	1444.9828	1937.2885	2353.4245	(97)
Space heating kWh	1095.8514	831.9872	688.1831	367.5839	130.9430	0.0000	0.0000	0.0000	0.0000	348.5495	749.7886	1118.8418	(98a)
Space heating requirement - total per year (kWh/year)	5331.7285												
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	1095.8514	831.9872	688.1831	367.5839	130.9430	0.0000	0.0000	0.0000	0.0000	348.5495	749.7886	1118.8418	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5331.7285												
Space heating per m2	(98c) / (4) = 38.9917 (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	1095.8514	831.9872	688.1831	367.5839	130.9430	0.0000	0.0000	0.0000	0.0000	348.5495	749.7886	1118.8418	(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)	1187.2713	901.3946	745.5938	398.2491	141.8667	0.0000	0.0000	0.0000	0.0000	377.6268	812.3387	1212.1796	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	254.7106	225.1421	239.0922	210.2213	203.7391	183.5601	181.2348	188.5043	190.6351	212.5885	226.0352	251.9490	(64)
Efficiency of water heater (217)m	86.9505	86.7171	86.2907	85.2999	83.0950	79.8000	79.8000	79.8000	79.8000	85.1613	86.5392	86.9966	(216)
Fuel for water heating, kWh/month	292.9374	259.6283	277.0777	246.4498	245.1882	230.0252	227.1113	236.2209	238.8912	249.6305	261.1940	289.6078	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.6141	26.9665	24.2803	17.7888	13.7406	11.2262	12.5346	16.2930	21.1630	27.7670	31.3627	34.5483	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-57.2576	-79.5128	-112.5607	-124.5178	-132.4862	-122.9218	-121.2933	-115.3134	-104.5889	-89.8544	-62.4735	-49.6364	(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	-36.1142	-75.5150	-149.3038	-223.1581	-294.0933	-295.2392	-291.8654	-247.6515	-182.1583	-107.7482	-48.1264	-28.6017	(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													5776.5206 (211)
Space heating fuel - main system 2													0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3053.9622 (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)	271.2851 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3151.9920 (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	6035.7758 (238)

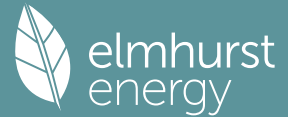
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5776.5206	0.2100	1213.0693 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3053.9622	0.2100	641.3321 (264)
Space and water heating			1854.4014 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	271.2851	0.1443	39.1548 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1172.4170	0.1349	-158.2046
PV Unit electricity exported	-1979.5751	0.1260	-249.4887
Total			-407.6934 (269)
Total CO2, kg/year			1497.7921 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5776.5206	1.1300	6527.4682 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3053.9622	1.1300	3450.9772 (278)
Space and water heating			9978.4455 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	271.2851	1.5338	416.1061 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1172.4170	1.4987	-1757.1378
PV Unit electricity exported	-1979.5751	0.4626	-915.8060
Total			-2672.9438 (283)
Total Primary energy kWh/year			7851.7086 (286)
Target Primary Energy Rate (TPER)			57.4200 (287)

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Plot Reference	Plot 17				Issued on Date	29/01/2026	
Assessment Reference	Plot 17			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	83 B	DER	3.70	TER	11.15		
Environmental	97 A	% DER < TER				66.82	
CO ₂ Emissions (t/year)	0.37	DFEE	40.67	TFEE	41.45		
Compliance Check	See BREL	% DFEE < TFEE				1.88	
% DPER < TPER	33.03	DPER	39.10	TPER	58.38		
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	56.1400 (1b)	x 2.6000 (2b)	= 145.9640 (1b) - (3b)
First floor	55.5200 (1c)	x 2.4000 (2c)	= 133.2480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 279.2120 (5)

2. Ventilation rate

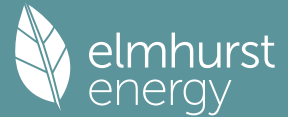
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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			14.2200	0.7752	11.0233		(27)
Front Door			2.1900	1.0000	2.1900		(26)
Heatloss Floor 1			56.1400	0.0700	3.9298	75.0000	4210.5000 (28a)
Ext Wall	159.9400	16.4100	143.5300	0.1400	20.0942	190.0000	27270.7005 (29a)
Roof	56.1400		56.1400	0.0900	5.0526	9.0000	505.2600 (30)
Total net area of external elements Aum(A, m ²)			272.2200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2899		(33)
Main dwelling							
00 Internal Wall			82.6800			9.0000	744.1200 (32c)
01 Internal Wall			79.2000			9.0000	712.8000 (32c)
Internal Floor 1			63.7700			18.0000	1147.8600 (32d)
Ground			56.1400			9.0000	505.2600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	35096.5004 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 314.3158 (35)
 Thermal bridges (User defined value 0.100 * total exposed area) 27.2220 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 69.5119 (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 19.2573 19.0269 18.7966 17.6448 17.4145 16.2627 16.2627 16.0324 16.7234 17.4145 17.8752 18.3359 (38)
 Heat transfer coeff 88.7691 88.5388 88.3084 87.1567 86.9263 85.7746 85.7746 85.5442 86.2353 86.9263 87.3870 87.8477 (39)
 Average = Sum(39)m / 12 = 87.0991

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.7950 0.7929 0.7909 0.7806 0.7785 0.7682 0.7682 0.7661 0.7723 0.7785 0.7826 0.7867 (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 2.8244 (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 82.5613 81.3352 79.6085 76.4248 74.0409 71.3975 69.9697 71.6843 73.5512 76.3797 79.6290 82.2822 (42b)
 Hot water usage for other uses 43.5550 41.9712 40.3874 38.8035 37.2197 35.6359 35.6359 37.2197 38.8035 40.3874 41.9712 43.5550 (42c)
 Average daily hot water use (litres/day) 116.1428 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy content 126.1163 123.3064 119.9959 115.2284 111.2607 107.0335 105.6056 108.9041 112.3548 116.7671 121.6002 125.8372 (44)
 Energy content (annual) 199.7375 175.5866 184.4292 157.7419 149.7782 131.6101 127.7209 134.8460 138.5447 158.4518 173.2417 197.0307 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1928.7193
 Distribution loss 29.9606 26.3380 27.6644 23.6613 22.4667 19.7415 19.1581 20.2269 20.7817 23.7678 25.9863 29.5546 (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 258.7974 228.9311 243.4892 214.8967 208.8382 188.7649 186.7808 193.9059 195.6995 217.5118 230.3965 256.0907 (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 258.7974 228.9311 243.4892 214.8967 208.8382 188.7649 186.7808 193.9059 195.6995 217.5118 230.3965 256.0907 (64)
 Total per year (kWh/year) = Sum(64)m = 2624.1027 (64)
 12Total per year (kWh/year) = 2624 (64)
 Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
 Heat gains from water heating, kWh/month 113.6607 101.0581 108.5707 98.1730 97.0492 89.4842 89.7152 92.0843 91.7899 99.9332 103.3267 112.7607 (65)

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

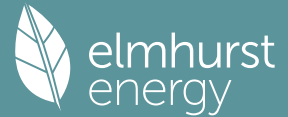
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 (66)m 141.2216 141.2216 141.2216 141.2216 141.2216 141.2216 141.2216 141.2216 141.2216 141.2216 141.2216 141.2216 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 151.3452 167.5607 151.3452 156.3900 151.3452 156.3900 151.3452 151.3452 156.3900 151.3452 156.3900 151.3452 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 273.9197 276.7621 269.5993 254.3505 235.1016 217.0104 204.9243 202.0819 209.2447 224.4935 243.7424 261.8337 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 37.1222 37.1222 37.1222 37.1222 37.1222 37.1222 37.1222 37.1222 37.1222 37.1222 37.1222 37.1222 (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) -112.9773 -112.9773 -112.9773 -112.9773 -112.9773 -112.9773 -112.9773 -112.9773 -112.9773 -112.9773 -112.9773 -112.9773 (71)
 Water heating gains (Table 5) 152.7697 150.3841 145.9283 136.3514 130.4425 124.2836 120.5849 123.7692 127.4860 134.3188 143.5093 151.5600 (72)
 Total internal gains 643.4011 660.0735 632.2393 612.4584 582.2558 563.0505 542.2208 542.5627 558.4872 575.5240 609.0082 630.1053 (73)

6. Solar gains

[Jan] Area m2 Solar flux Table 6a W/m2 g Specific data or Table 6b FF Specific data or Table 6c Access factor Table 6d Gains W
 North 7.8600 10.6334 0.4500 0.8000 0.7700 20.8512 (74)
 East 1.2500 19.6403 0.4500 0.8000 0.7700 6.1248 (76)
 South 4.5200 46.7521 0.4500 0.8000 0.7700 52.7199 (78)
 West 0.5900 19.6403 0.4500 0.8000 0.7700 2.8909 (80)
 Solar gains 82.5868 143.8260 206.7399 275.4273 327.9598 334.6472 318.8288 277.9215 230.0823 161.4884 99.4553 70.3515 (83)
 Total gains 725.9879 803.8995 838.9792 887.8857 910.2155 897.6977 861.0496 820.4842 788.5695 737.0124 708.4635 700.4569 (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	109.8246	110.1103	110.3975	111.8564	112.1528	113.6587	113.6587	113.9648	113.0515	112.1528	111.5615	110.9765
alpha	8.3216	8.3407	8.3598	8.4571	8.4769	8.5772	8.5772	8.5977	8.5368	8.4769	8.4374	8.3984
util living area												
	0.9987	0.9963	0.9897	0.9541	0.8343	0.6080	0.4381	0.4791	0.7366	0.9618	0.9956	0.9990 (86)
Living	20.4836	20.5676	20.6780	20.8317	20.9322	20.9617	20.9636	20.9635	20.9545	20.8395	20.6404	20.4715
Non living	19.7827	19.8678	19.9783	20.1323	20.2168	20.2439	20.2447	20.2465	20.2370	20.1430	19.9484	19.7771
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	20.7359	20.5676	20.6780	20.8317	20.9322	20.9617	20.9636	20.9635	20.9545	20.8395	20.6404	20.5455 (87)
Th 2	20.2577	20.2595	20.2613	20.2702	20.2720	20.2810	20.2810	20.2828	20.2774	20.2720	20.2684	20.2648 (88)
util rest of house												
	0.9981	0.9949	0.9856	0.9364	0.7866	0.5415	0.3666	0.4047	0.6677	0.9433	0.9935	0.9986 (89)
MIT 2	20.0147	19.8678	19.9783	20.1323	20.2168	20.2439	20.2447	20.2465	20.2370	20.1430	19.9484	19.8453 (90)
Living area fraction												
MIT	20.1274	19.9771	20.0876	20.2415	20.3285	20.3560	20.3569	20.3585	20.3490	20.2518	20.0565	19.9547 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1274	19.9771	20.0876	20.2415	20.3285	20.3560	20.3569	20.3585	20.3490	20.2518	20.0565	19.9547 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9980	0.9942	0.9843	0.9356	0.7906	0.5485	0.3742	0.4126	0.6748	0.9427	0.9927	0.9984 (94)
Useful gains	724.5428	799.2045	825.8425	830.7102	719.5968	492.4000	322.2065	338.5287	532.0924	694.7851	703.3261	699.3197 (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												
	1404.9798	1334.9105	1199.8955	988.4880	750.0460	493.7215	322.2505	338.6274	538.8880	838.9957	1132.2269	1384.0118 (97)
Space heating kWh												
	506.2451	359.9944	278.2954	113.6000	22.6542	0.0000	0.0000	0.0000	0.0000	107.2927	308.8086	509.4109 (98a)
Space heating requirement - total per year (kWh/year)												2206.3015
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												
	506.2451	359.9944	278.2954	113.6000	22.6542	0.0000	0.0000	0.0000	0.0000	107.2927	308.8086	509.4109 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2206.3015
Space heating per m2										(98c) / (4) =		19.7591 (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 %)												274.0830 (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												
	506.2451	359.9944	278.2954	113.6000	22.6542	0.0000	0.0000	0.0000	0.0000	107.2927	308.8086	509.4109 (98)
Space heating efficiency (main heating system 1)												
	274.0830	274.0830	274.0830	274.0830	274.0830	0.0000	0.0000	0.0000	0.0000	274.0830	274.0830	274.0830 (210)
Space heating fuel (main heating system)												
	184.7051	131.3451	101.5369	41.4473	8.2655	0.0000	0.0000	0.0000	0.0000	39.1461	112.6698	185.8601 (211)
Space heating efficiency (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement												
	258.7974	228.9311	243.4892	214.8967	208.8382	188.7649	186.7808	193.9059	195.6995	217.5118	230.3965	256.0907 (64)
Efficiency of water heater												179.8468 (216)
(217)m												179.8468 (217)
Fuel for water heating, kWh/month												
	143.8989	127.2923	135.3870	119.4888	116.1201	104.9588	103.8555	107.8173	108.8146	120.9428	128.1071	142.3938 (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	26.7322	24.1452	26.7322	25.8699	26.7322	25.8699	26.7322	26.7322	25.8699	26.7322	25.8699	26.7322 (231)
Lighting	32.1750	25.8120	23.2408	17.0272	13.1523	10.7456	11.9980	15.5954	20.2569	26.5782	30.0200	33.0692 (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												804.9758 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												179.8468
Water heating fuel used												1459.0770 (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)												314.7501 (230a)
Total electricity for the above, kWh/year												314.7501 (231)
Electricity for lighting (calculated in Appendix L)												259.6706 (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	2838.4735 (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	804.9758	0.1569	126.3075 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1459.0770	0.1408	205.4278 (264)
Space and water heating			331.7353 (265)
Pumps, fans and electric keep-hot	314.7501	0.1387	43.6597 (267)
Energy for lighting	259.6706	0.1443	37.4785 (268)
Total CO2, kg/year			412.8735 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7000 (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	804.9758	1.5809	1272.5801 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1459.0770	1.5206	2218.6665 (278)
Space and water heating			3491.2466 (279)
Pumps, fans and electric keep-hot	314.7501	1.5128	476.1540 (281)
Energy for lighting	259.6706	1.5338	398.2914 (282)
Total Primary energy kWh/year			4365.6919 (286)
Dwelling Primary energy Rate (DPER)			39.1000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	56.1400 (1b)	x 2.6000 (2b)	= 145.9640 (1b) - (3b)
First floor	55.5200 (1c)	x 2.4000 (2c)	= 133.2480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 279.2120 (5)

2. Ventilation rate

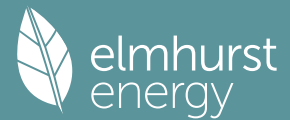
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1433 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3933 (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) = 0.3933 (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	0.5014	0.4916	0.4817	0.4326	0.4228	0.3736	0.3736	0.3638	0.3933	0.4228	0.4424	0.4621 (22b)
Effective ac	0.6257	0.6208	0.6160	0.5936	0.5894	0.5698	0.5698	0.5662	0.5773	0.5894	0.5979	0.6068 (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			2.1900	1.0000	2.1900		(26)

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TER Opening Type			14.2200	1.1450	16.2824	(27)
Heatloss Floor 1			56.1400	0.1300	7.2982	(28a)
Ext Wall	159.9400	16.4100	143.5300	0.1800	25.8354	(29a)
Roof	56.1400		56.1400	0.1100	6.1754	(30)
Total net area of external elements Aum(A, m2)			272.2200			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	57.7814		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 314.3158 (35)

List of Thermal Bridges													
K1 Element													
E16 Corner (normal)													
E1 Steel lintel with perforated steel base plate													
E3 Sill													
E4 Jamb													
E5 Ground floor (normal)													
E6 Intermediate floor within a dwelling													
E17 Corner (inverted - internal area greater than external area)													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges													
Total fabric heat loss													

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	57.6524	57.2026	56.7618	54.6911	54.3037	52.5002	52.5002	52.1662	53.1949	54.3037	55.0874	55.9068	(38)
Heat transfer coeff	125.1532	124.7035	124.2626	122.1919	121.8045	120.0010	120.0010	119.6671	120.6957	121.8045	122.5883	123.4076	(39)
Average = Sum(39)m / 12 =												122.1901	
HLP	1.1208	1.1168	1.1129	1.0943	1.0909	1.0747	1.0747	1.0717	1.0809	1.0909	1.0979	1.1052	(40)
HLP (average)												1.0943	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8244 (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													
Energy conte													(44)
Energy content (annual)													(45)
Distribution loss (46)m = 0.15 x (45)m													(46)
Water storage loss (or HIU loss):													(47)
Store volume													(48)
a) If manufacturer declared loss factor is known (kWh/day):													(49)
Temperature factor from Table 2b													(50)
Enter (49) or (54) in (55)													(51)
Total storage loss													(52)
If cylinder contains dedicated solar storage													(53)
Primary loss													(54)
Combi loss													(55)
Total heat required for water heating calculated for each month													(56)
WWHRS													(57)
PV diverter													(58)
Solar input													(59)
FGHRS													(60)
Output from w/h													(61)
12Total per year (kWh/year)													(62)
Electric shower(s)													(63)
Heat gains from water heating, kWh/month													(64)

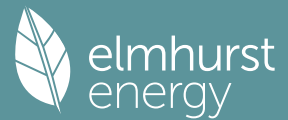
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m													(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													(69)
Pumps, fans													(70)
Losses e.g. evaporation (negative values) (Table 5)													(71)
Water heating gains (Table 5)													(72)
Total internal gains													(73)

6. Solar gains

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

North	7.8600	10.6334	0.6300	0.7000	0.7700	25.5427 (74)
East	1.2500	19.6403	0.6300	0.7000	0.7700	7.5029 (76)
South	4.5200	46.7521	0.6300	0.7000	0.7700	64.5819 (78)
West	0.5900	19.6403	0.6300	0.7000	0.7700	3.5414 (80)

Solar gains	101.1689	176.1868	253.2564	337.3985	401.7507	409.9428	390.5653	340.4538	281.8508	197.8233	121.8327	86.1806	(83)
Total gains	738.8238	830.5142	879.7496	944.1108	978.2604	964.2472	924.0400	874.2704	831.5919	767.6012	725.0948	710.5399	(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	77.8967	78.1777	78.4550	79.7845	80.0383	81.2412	81.2412	81.4679	80.7736	80.0383	79.5266	78.9986	
alpha	6.1931	6.2118	6.2303	6.3190	6.3359	6.4161	6.4161	6.4312	6.3849	6.3359	6.3018	6.2666	
util living area	0.9990	0.9976	0.9941	0.9779	0.9183	0.7503	0.5645	0.6173	0.8652	0.9831	0.9974	0.9992	(86)
MIT	19.9166	20.0545	20.2561	20.5533	20.8112	20.9641	20.9949	20.9913	20.9087	20.5877	20.2113	19.9050	(87)
Th 2	19.9838	19.9871	19.9903	20.0055	20.0083	20.0215	20.0215	20.0240	20.0164	20.0083	20.0026	19.9966	(88)
util rest of house	0.9985	0.9965	0.9914	0.9669	0.8779	0.6561	0.4430	0.4933	0.7908	0.9725	0.9960	0.9989	(89)
MIT 2	18.7241	18.9029	19.1624	19.5470	19.8501	20.0030	20.0202	20.0215	19.9580	19.5957	19.1157	18.7188	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	18.9104	19.0828	19.3332	19.7042	20.0002	20.1531	20.1725	20.1730	20.1065	19.7506	19.2868	18.9041	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.9104	19.0828	19.3332	19.7042	20.0002	20.1531	20.1725	20.1730	20.1065	19.7506	19.2868	18.9041	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9951	0.9888	0.9625	0.8775	0.6698	0.4621	0.5128	0.7987	0.9687	0.9946	0.9983	(94)
Useful gains	737.2131	826.4728	869.9214	908.7449	858.4002	645.8204	427.0302	448.3625	664.1975	743.5482	721.1528	709.3249	(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	1828.5339	1768.6403	1594.6925	1320.1805	1011.0004	666.3778	428.7006	451.5005	724.9573	1114.5846	1493.9619	1814.5991	(97)
Space heating kWh	811.9427	633.1366	539.2297	296.2336	113.5346	0.0000	0.0000	0.0000	0.0000	276.0511	556.4226	822.3241	(98a)
Space heating requirement - total per year (kWh/year)													4048.8749
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	811.9427	633.1366	539.2297	296.2336	113.5346	0.0000	0.0000	0.0000	0.0000	276.0511	556.4226	822.3241	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													4048.8749
Space heating per m2													(98c) / (4) = 36.2607 (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	811.9427	633.1366	539.2297	296.2336	113.5346	0.0000	0.0000	0.0000	0.0000	276.0511	556.4226	822.3241	(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)	879.6779	685.9551	584.2142	320.9465	123.0060	0.0000	0.0000	0.0000	0.0000	299.0803	602.8413	890.9253	(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	250.6635	221.5844	235.3553	207.0252	200.7043	180.8934	178.6469	185.7721	187.8280	209.3779	222.5250	247.9568	(64)
Efficiency of water heater (217)m	86.4987	86.2774	85.8578	84.8628	82.8332	79.8000	79.8000	79.8000	79.8000	84.6806	86.0283	79.8000	(216)
Fuel for water heating, kWh/month	289.7887	256.8279	274.1222	243.9528	242.2993	226.6835	223.8684	232.7971	235.3734	247.2559	258.6650	286.5265	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	31.4465	25.2276	22.7146	16.6417	12.8545	10.5023	11.7263	15.2423	19.7983	25.9764	29.3403	32.3205	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-50.7628	-70.6653	-100.2763	-111.2117	-118.5824	-110.1419	-108.7283	-103.2803	-93.4918	-80.0489	-55.4682	-43.9895	(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	-31.4372	-65.8135	-130.2564	-194.8652	-256.9574	-257.9867	-254.9965	-216.2563	-158.9464	-93.9108	-41.8985	-24.8876	(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													4386.6467 (211)
Space heating fuel - main system 2													0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3018.1607 (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)	253.7916 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2774.8601 (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	4969.7388 (238)

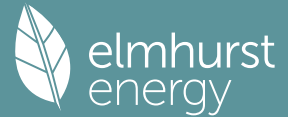
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4386.6467	0.2100	921.1958 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3018.1607	0.2100	633.8137 (264)
Space and water heating			1555.0095 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	253.7916	0.1443	36.6300 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1046.6476	0.1349	-141.1711
PV Unit electricity exported	-1728.2126	0.1260	-217.7686
Total			-358.9398 (269)
Total CO2, kg/year			1244.6290 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4386.6467	1.1300	4956.9107 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3018.1607	1.1300	3410.5216 (278)
Space and water heating			8367.4323 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	253.7916	1.5338	389.2740 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1046.6476	1.4985	-1568.4095
PV Unit electricity exported	-1728.2126	0.4625	-799.3686
Total			-2367.7781 (283)
Total Primary energy kWh/year			6519.0290 (286)
Target Primary Energy Rate (TPER)			58.3800 (287)

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Plot Reference	Plot 18			Issued on Date	29/01/2026	
Assessment Reference	Plot 18		Plot Type Ref			
Plot Address				SAP Version	10.2	
SAP Rating	84 B	DER	3.10	TER	8.68	
Environmental	97 A	% DER < TER				64.29
CO ₂ Emissions (t/year)	0.52	DFEE	38.73	TFEE	40.03	
Compliance Check	See BREL	% DFEE < TFEE				3.24
% DPER < TPER	28.61	DPER	32.55	TPER	45.59	
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	92.9600 (1b)	x 2.6000 (2b)	= 241.6960 (1b) - (3b)
First floor	95.4000 (1c)	x 2.4000 (2c)	= 228.9600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	188.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	470.6560 (5)

2. Ventilation rate

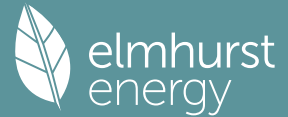
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =												82.8000 (23c)
Effective ac	0.2135	0.2110	0.2085	0.1960	0.1935	0.1810	0.1810	0.1785	0.1860	0.1935	0.1985	0.2035 (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			35.2300	0.7752	27.3101		(27)
Front Door			2.1800	1.0000	2.1800		(26)
Heatloss Floor 1			92.9600	0.0700	6.5072	75.0000	6972.0000 (28a)
Ext Wall	204.0000	37.4100	166.5900	0.1400	23.3226	190.0000	31652.1000 (29a)
Roof	95.4000		95.4000	0.0900	8.5860	9.0000	858.6000 (30)
Total net area of external elements Aum(A, m ²)			392.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	67.9059		(33)
Main dwelling							
00 Internal Wall			145.1800			9.0000	1306.6199 (32c)
01 Internal Wall			201.7000			9.0000	1815.3000 (32c)
Internal Floor 1			95.4000			18.0000	1717.2000 (32d)
Ground			95.4000			9.0000	858.6000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	45180.4199 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 239.8621 (35)
Thermal bridges (User defined value 0.100 * total exposed area) 39.2360 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 107.1419 (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
	33.1601	32.7718	32.3835	30.4420	30.0537	28.1123	28.1123	27.7240	28.8889	30.0537	30.8303	31.6069
Heat transfer coeff												
	140.3019	139.9137	139.5254	137.5839	137.1956	135.2542	135.2542	134.8659	136.0307	137.1956	137.9722	138.7488
Average = Sum(39)m / 12 =												137.4868
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7449	0.7428	0.7407	0.7304	0.7284	0.7181	0.7181	0.7160	0.7222	0.7284	0.7325	0.7366
HLP (average)												0.7299
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9868	(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														
	85.7125	84.4395	82.6469	79.3417	76.8668	74.1226	72.6403	74.4203	76.3584	79.2949	82.6682	85.4227	85.4227	(42b)
Hot water usage for other uses														
	45.2174	43.5731	41.9288	40.2846	38.6403	36.9960	36.9960	38.6403	40.2846	41.9288	43.5731	45.2174	45.2174	(42c)
Average daily hot water use (litres/day)													120.5756	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	130.9298	128.0126	124.5757	119.6263	115.5071	111.1186	109.6363	113.0606	116.6430	121.2237	126.2412	130.6400	130.6400	(44)
Energy conte	207.3608	182.2882	191.4683	163.7624	155.4948	136.6333	132.5956	139.9926	143.8325	164.4994	179.8538	204.5507	204.5507	(45)
Energy content (annual)													2002.3325	
Distribution loss (46)m = 0.15 x (45)m														
	31.1041	27.3432	28.7202	24.5644	23.3242	20.4950	19.8893	20.9989	21.5749	24.6749	26.9781	30.6826	30.6826	(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	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	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	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	0.0000	(61)
Total heat required for water heating calculated for each month														
	266.4208	235.6327	250.5282	220.9172	214.5547	193.7881	191.6555	199.0526	200.9873	223.5594	237.0086	263.6107	263.6107	(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	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h														
	266.4208	235.6327	250.5282	220.9172	214.5547	193.7881	191.6555	199.0526	200.9873	223.5594	237.0086	263.6107	263.6107	(64)
12Total per year (kWh/year)													2697.7159	(64)
Electric shower(s)													2698	(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														
	116.1954	103.2864	110.9112	100.1748	98.9500	91.1544	91.3360	93.7955	93.5481	101.9440	105.5252	115.2611	115.2611	(65)

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

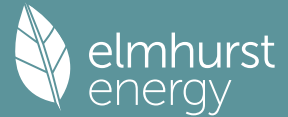
Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	149.3378	149.3378	149.3378	149.3378	149.3378	149.3378	149.3378	149.3378	149.3378	149.3378	149.3378	149.3378	149.3378	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	184.3048	204.0517	184.3048	190.4483	184.3048	190.4483	184.3048	184.3048	190.4483	184.3048	190.4483	184.3048	184.3048	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	359.8440	363.5780	354.1683	334.1362	308.8492	285.0831	269.2058	265.4717	274.8814	294.9136	320.2005	343.9667	343.9667	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	37.9338	37.9338	37.9338	37.9338	37.9338	37.9338	37.9338	37.9338	37.9338	37.9338	37.9338	37.9338	37.9338	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)														
	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	-119.4702	(71)
Water heating gains (Table 5)														
	156.1767	153.7000	149.0742	139.1317	132.9973	126.6033	122.7634	126.0692	129.9280	137.0215	146.5628	154.9208	154.9208	(72)
Total internal gains														
	768.1267	789.1311	755.3486	731.5175	693.9526	669.9360	644.0753	643.6471	663.0590	684.0412	725.0129	750.9936	750.9936	(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		
Northeast					16.2100	11.2829	0.4500		0.8000	0.7700		45.6290 (75)
Southeast					4.0000	36.7938	0.4500		0.8000	0.7700		36.7173 (77)
Southwest					11.7100	36.7938	0.4500		0.8000	0.7700		107.4899 (79)
Northwest					3.3100	11.2829	0.4500		0.8000	0.7700		9.3172 (81)
Solar gains	199.1534	357.4829	537.6014	747.3702	911.2836	937.3172	890.0974	762.8231	609.4588	408.1656	241.8636	168.2832 (83)
Total gains	967.2802	1146.6140	1292.9500	1478.8877	1605.2363	1607.2532	1534.1727	1406.4701	1272.5178	1092.2068	966.8765	919.2768 (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	89.4508	89.6990	89.9486	91.2179	91.4761	92.7891	92.7891	93.0563	92.2594	91.4761	90.9612	90.4521
alpha	6.9634	6.9799	6.9966	7.0812	7.0984	7.1859	7.1859	7.2038	7.1506	7.0984	7.0641	7.0301
util living area												
	0.9988	0.9956	0.9838	0.9216	0.7570	0.5356	0.3876	0.4404	0.7136	0.9603	0.9961	0.9991 (86)
Living	20.2980	20.4249	20.5967	20.8116	20.9271	20.9545	20.9565	20.9564	20.9419	20.7751	20.4991	20.2804
Non living	19.6460	19.7739	19.9450	20.1561	20.2535	20.2806	20.2816	20.2834	20.2702	20.1280	19.8561	19.6347
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	20.6409	20.4249	20.5967	20.8116	20.9271	20.9545	20.9565	20.9564	20.9419	20.7751	20.4991	20.3810 (87)
Th 2	20.3014	20.3032	20.3050	20.3140	20.3158	20.3249	20.3249	20.3267	20.3213	20.3158	20.3122	20.3086 (88)
util rest of house												
	0.9984	0.9942	0.9789	0.9009	0.7122	0.4804	0.3283	0.3763	0.6525	0.9452	0.9946	0.9989 (89)
MIT 2	19.9661	19.7739	19.9450	20.1561	20.2535	20.2806	20.2816	20.2834	20.2702	20.1280	19.8561	19.7290 (90)
Living area fraction												
MIT	20.0404	19.8455	20.0167	20.2283	20.3276	20.3548	20.3559	20.3575	20.3441	20.1992	19.9268	19.8007 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0404	19.8455	20.0167	20.2283	20.3276	20.3548	20.3559	20.3575	20.3441	20.1992	19.9268	19.8007 (93)

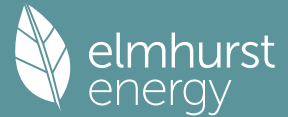
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9982	0.9931	0.9764	0.8980	0.7130	0.4829	0.3310	0.3793	0.6547	0.9421	0.9936	0.9986 (94)
Useful gains	965.5450	1138.7362	1262.4841	1328.0379	1144.5971	776.1597	507.8742	533.4195	833.0953	1028.9228	960.6987	917.9912 (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	2208.4074	2091.0807	1885.9266	1558.5896	1183.6699	778.3568	507.9949	533.7277	849.3873	1316.9737	1769.7443	2164.5839 (97)
Space heating kWh	924.6896	639.9755	463.8412	165.9972	29.0701	0.0000	0.0000	0.0000	0.0000	214.3099	582.5128	927.4650 (98a)
Space heating requirement - total per year (kWh/year)												3947.8614
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	924.6896	639.9755	463.8412	165.9972	29.0701	0.0000	0.0000	0.0000	0.0000	214.3099	582.5128	927.4650 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3947.8614
Space heating per m2										(98c) / (4) =		20.9591 (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 %)												264.9995 (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	924.6896	639.9755	463.8412	165.9972	29.0701	0.0000	0.0000	0.0000	0.0000	214.3099	582.5128	927.4650 (98)
Space heating efficiency (main heating system 1)	264.9995	264.9995	264.9995	264.9995	264.9995	0.0000	0.0000	0.0000	0.0000	264.9995	264.9995	264.9995 (210)
Space heating fuel (main heating system)	348.9402	241.5007	175.0348	62.6406	10.9699	0.0000	0.0000	0.0000	0.0000	80.8718	219.8166	349.9875 (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	266.4208	235.6327	250.5282	220.9172	214.5547	193.7881	191.6555	199.0526	200.9873	223.5594	237.0086	263.6107 (64)
Efficiency of water heater (217)m	176.1316	176.1316	176.1316	176.1316	176.1316	176.1316	176.1316	176.1316	176.1316	176.1316	176.1316	176.1316 (216)
Fuel for water heating, kWh/month	151.2624	133.7822	142.2393	125.4274	121.8150	110.0246	108.8139	113.0136	114.1120	126.9275	134.5634	149.6669 (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	53.9371	48.7174	53.9371	52.1972	53.9371	52.1972	53.9371	53.9371	52.1972	53.9371	52.1972	53.9371 (231)
Lighting	39.1820	31.4332	28.3021	20.7354	16.0166	13.0857	14.6109	18.9918	24.6684	32.3663	36.5577	40.2710 (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												1489.7620 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.1316
Water heating fuel used												1531.6482 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1060)												635.0656 (230a)
mechanical ventilation fans (SFP = 1.1060)												635.0656 (231)
Total electricity for the above, kWh/year												316.2211 (232)
Electricity for lighting (calculated in Appendix L)												

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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	3972.6968 (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	1489.7620	0.1570	233.9421 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1531.6482	0.1408	215.6766 (264)
Space and water heating			449.6188 (265)
Pumps, fans and electric keep-hot	635.0656	0.1387	88.0914 (267)
Energy for lighting	316.2211	0.1443	45.6405 (268)
Total CO2, kg/year			583.3507 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1489.7620	1.5813	2355.8051 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1531.6482	1.5207	2329.1354 (278)
Space and water heating			4684.9404 (279)
Pumps, fans and electric keep-hot	635.0656	1.5128	960.7272 (281)
Energy for lighting	316.2211	1.5338	485.0304 (282)
Total Primary energy kWh/year			6130.6980 (286)
Dwelling Primary energy Rate (DPER)			32.5500 (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	92.9600 (1b)	x 2.6000 (2b)	= 241.6960 (1b) - (3b)
First floor	95.4000 (1c)	x 2.4000 (2c)	= 228.9600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	188.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 470.6560 (5)

2. Ventilation rate

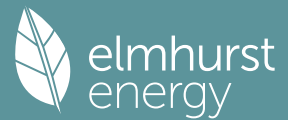
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.0850 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3350 (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) = 0.3350 (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	0.4271	0.4187	0.4104	0.3685	0.3601	0.3182	0.3182	0.3099	0.3350	0.3601	0.3769	0.3936 (22b)
Effective ac	0.5912	0.5877	0.5842	0.5679	0.5648	0.5506	0.5506	0.5480	0.5561	0.5648	0.5710	0.5775 (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)

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TER Opening Type			35.2300	1.1450	40.3397	(27)
Heatloss Floor 1			92.9600	0.1300	12.0848	(28a)
Ext Wall	204.0000	37.4100	166.5900	0.1800	29.9862	(29a)
Roof	95.4000		95.4000	0.1100	10.4940	(30)
Total net area of external elements Aum(A, m2)			392.3600			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	95.0847		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.8621 (35)

List of Thermal Bridges													
K1 Element													
E16 Corner (normal)													
E1 Steel lintel with perforated steel base plate													
E3 Sill													
E4 Jamb													
E5 Ground floor (normal)													
E6 Intermediate floor within a dwelling													
E17 Corner (inverted - internal area greater than external area)													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges													
Total fabric heat loss													

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	91.8248	91.2747	90.7355	88.2029	87.7290	85.5231	85.5231	85.1146	86.3728	87.7290	88.6876	89.6898	(38)
Heat transfer coeff	200.6542	200.1041	199.5649	197.0323	196.5584	194.3525	194.3525	193.9440	195.2022	196.5584	197.5170	198.5192	(39)
Average = Sum(39)m / 12 =												197.0300	
HLP	1.0653	1.0623	1.0595	1.0460	1.0435	1.0318	1.0318	1.0296	1.0363	1.0435	1.0486	1.0539	(40)
HLP (average)												1.0460	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9868 (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													
Energy conte													(44)
Energy content (annual)													(45)
Distribution loss (46)m = 0.15 x (45)m													(46)
Water storage loss (or HIU loss):													
Store volume													(47)
a) If manufacturer declared loss factor is known (kWh/day):													(48)
Temperature factor from Table 2b													(49)
Enter (49) or (54) in (55)													(55)
Total storage loss													(56)
If cylinder contains dedicated solar storage													(57)
Primary loss													(59)
Combi loss													(61)
Total heat required for water heating calculated for each month													(62)
WWHRS													(63a)
PV diverter													(63b)
Solar input													(63c)
FGHRS													(63d)
Output from w/h													(64)
12Total per year (kWh/year)													(64)
Electric shower(s)													(64a)
Heat gains from water heating, kWh/month													(65)

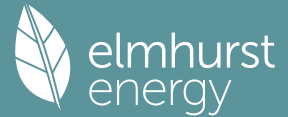
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m													(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													(69)
Pumps, fans													(70)
Losses e.g. evaporation (negative values) (Table 5)													(71)
Water heating gains (Table 5)													(72)
Total internal gains													(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2	or Table 6b	or Table 6c	Table 6d	
Northeast	16.2100	11.2829	0.6300	0.7000	0.7700	55.8955 (75)
Southeast	4.0000	36.7938	0.6300	0.7000	0.7700	44.9787 (77)
Southwest	11.7100	36.7938	0.6300	0.7000	0.7700	131.6751 (79)
Northwest	3.3100	11.2829	0.6300	0.7000	0.7700	11.4136 (81)

Solar gains	243.9629	437.9165	658.5617	915.5285	1116.3225	1148.2136	1090.3693	934.4583	746.5870	500.0028	296.2829	206.1469	(83)
Total gains	1006.3436	1221.3015	1408.1642	1641.2999	1804.5290	1809.4034	1725.6985	1569.3592	1400.8999	1178.2979	1015.5497	951.3944	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.5460	62.7179	62.8874	63.6957	63.8493	64.5740	64.5740	64.7100	64.2929	63.8493	63.5394	63.2187	
alpha	5.1697	5.1812	5.1925	5.2464	5.2566	5.3049	5.3049	5.3140	5.2862	5.2566	5.2360	5.2146	
util living area	0.9986	0.9959	0.9877	0.9513	0.8455	0.6550	0.4894	0.5559	0.8239	0.9758	0.9965	0.9990	(86)
MIT	19.5983	19.8012	20.1010	20.5067	20.8187	20.9647	20.9937	20.9881	20.8843	20.4634	19.9610	19.5721	(87)
Th 2	20.0293	20.0317	20.0341	20.0451	20.0472	20.0569	20.0569	20.0587	20.0532	20.0472	20.0430	20.0386	(88)
util rest of house	0.9981	0.9946	0.9834	0.9345	0.7977	0.5714	0.3877	0.4485	0.7533	0.9645	0.9952	0.9986	(89)
MIT 2	18.3797	18.6407	19.0239	19.5357	19.8922	20.0363	20.0548	20.0543	19.9709	19.4925	18.8541	18.3527	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	18.5138	18.7685	19.1425	19.6425	19.9942	20.1385	20.1581	20.1570	20.0714	19.5994	18.9759	18.4869	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.5138	18.7685	19.1425	19.6425	19.9942	20.1385	20.1581	20.1570	20.0714	19.5994	18.9759	18.4869	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9970	0.9920	0.9780	0.9257	0.7947	0.5790	0.3988	0.4600	0.7549	0.9572	0.9929	0.9978	(94)
Useful gains	1003.3540	1211.5117	1377.2060	1519.3346	1433.9905	1047.5909	688.2767	721.9822	1057.5302	1127.8404	1008.3213	949.2678	(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	2852.0541	2775.1358	2522.9939	2116.6230	1630.2963	1076.4133	691.5269	728.6541	1165.6344	1768.9041	2345.6950	2836.2307	(97)
Space heating kWh	1375.4328	1050.7554	852.4662	430.0477	146.0515	0.0000	0.0000	0.0000	0.0000	476.9514	962.9091	1403.9004	(98a)
Space heating requirement - total per year (kWh/year)	6698.5144												
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	1375.4328	1050.7554	852.4662	430.0477	146.0515	0.0000	0.0000	0.0000	0.0000	476.9514	962.9091	1403.9004	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6698.5144												
Space heating per m2	(98c) / (4) = 35.5623 (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	1375.4328	1050.7554	852.4662	430.0477	146.0515	0.0000	0.0000	0.0000	0.0000	476.9514	962.9091	1403.9004	(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)	1490.1764	1138.4132	923.5820	465.9238	158.2357	0.0000	0.0000	0.0000	0.0000	516.7404	1043.2384	1521.0188	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	258.2869	228.2860	242.3944	213.0457	206.4209	185.9166	183.5217	190.9187	193.1158	215.4255	229.1371	255.4768	(64)
Efficiency of water heater (217)m	87.2444	87.0478	86.6368	85.6017	83.2982	79.8000	79.8000	79.8000	79.8000	85.7896	86.9157	79.8000	(216)
Fuel for water heating, kWh/month	296.0499	262.2537	279.7824	248.8803	247.8095	232.9782	229.9770	239.2465	241.9997	251.1092	263.6313	292.6947	(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	38.2949	30.7216	27.6614	20.2659	15.6540	12.7894	14.2801	18.5618	24.1099	31.6335	35.7300	39.3592	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-78.6180	-106.8268	-147.9993	-160.0835	-167.3170	-154.1073	-151.9600	-145.8458	-134.5712	-118.8393	-84.8881	-68.4284	(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	-57.4937	-119.1632	-233.7307	-346.7372	-454.5245	-455.4623	-450.3174	-383.2621	-283.4313	-169.2137	-76.3376	-45.6224	(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	7257.3288 (211)												
Space heating fuel - main system 2	0.0000 (213)												

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3086.4122 (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)	309.0617 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4594.7809 (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	6144.0218 (238)

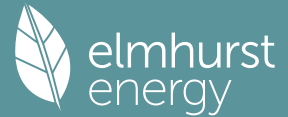
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7257.3288	0.2100	1524.0390 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3086.4122	0.2100	648.1466 (264)
Space and water heating			2172.1856 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	309.0617	0.1443	44.6072 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1519.4847	0.1354	-205.7756
PV Unit electricity exported	-3075.2961	0.1263	-388.2663
Total			-594.0419 (269)
Total CO2, kg/year			1634.6801 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.6800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	7257.3288	1.1300	8200.7815 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3086.4122	1.1300	3487.6458 (278)
Space and water heating			11688.4273 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	309.0617	1.5338	474.0492 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1519.4847	1.5006	-2280.0674
PV Unit electricity exported	-3075.2961	0.4635	-1425.2509
Total			-3705.3183 (283)
Total Primary energy kWh/year			8587.2590 (286)
Target Primary Energy Rate (TPER)			45.5900 (287)

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Plot Reference	Plot 19				Issued on Date	29/01/2026	
Assessment Reference	Plot 19			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	85 B	DER	3.40	TER	10.02		
Environmental	97 A	% DER < TER				66.07	
CO ₂ Emissions (t/year)	0.33	DFEE	34.04	TFEE	35.39		
Compliance Check	See BREL	% DFEE < TFEE				3.81	
% DPER < TPER	30.82	DPER	36.15	TPER	52.25		
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	52.9600 (1b)	x 2.6000 (2b)	= 137.6960 (1b) - (3b)
First floor	52.0200 (1c)	x 2.4000 (2c)	= 124.8480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 262.5440 (5)

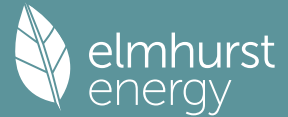
2. Ventilation rate

	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			15.5700	0.7752	12.0698		(27)
Front Door			2.1500	1.0000	2.1500		(26)
Heatloss Floor 1			52.9600	0.0700	3.7072	75.0000	3972.0000 (28a)
Ext Wall	105.6900	17.7200	87.9700	0.1400	12.3158	190.0000	16714.3005 (29a)
Roof	52.9600		52.9600	0.0900	4.7664	9.0000	476.6400 (30)
Total net area of external elements Aum (A, m ²)			211.6100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.0092		(33)
Main dwelling							
Ground			25.2200	0.0000	0.0000	180.0000	4539.5999 (32)
First			23.2800	0.0000	0.0000	180.0000	4190.4001 (32)
00 Internal Wall			98.4400			9.0000	885.9600 (32c)
01 Internal Wall			107.0400			9.0000	963.3600 (32c)
Internal Floor 1			52.0200			18.0000	936.3600 (32d)
Ground			52.0200			9.0000	468.1800 (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) = 33146.8005 (34)
315.7440 (35)
21.1610 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 56.1702 (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	17.2792	17.0788	16.8785	15.8767	15.6763	14.6746	14.6746	14.4742	15.0753	15.6763	16.0770	16.4778
Heat transfer coeff	73.4493	73.2490	73.0486	72.0469	71.8465	70.8447	70.8447	70.6444	71.2454	71.8465	72.2472	72.6479
Average = $\text{Sum}(39)\text{m} / 12 =$												
	71.9968											
	71.9968											
HLP	0.6997	0.6977	0.6958	0.6863	0.6844	0.6748	0.6748	0.6729	0.6787	0.6844	0.6882	0.6920
HLP (average)												0.6858
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7811
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												
81.7200	80.5064	78.7973	75.6461	73.2864	70.6700	69.2567	70.9539	72.8017	75.6014	78.8175	81.4438	(42b)
Hot water usage for other uses												
43.1112	41.5435	39.9758	38.4081	36.8405	35.2728	35.2728	36.8405	38.4081	39.9758	41.5435	43.1112	(42c)
Average daily hot water use (litres/day)												114.9593
												(43)
Daily hot water use												
124.8312	122.0499	118.7731	114.0542	110.1269	105.9428	104.5295	107.7943	111.2099	115.5772	120.3610	124.5549	(44)
Energy conte	197.7021	173.7974	182.5498	156.1345	148.2520	130.2690	126.4194	133.4719	137.1329	156.8372	171.4763	195.0229
Energy content (annual)												(45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
29.6553	26.0696	27.3825	23.4202	22.2378	19.5403	18.9629	20.0208	20.5699	23.5256	25.7215	29.2534	(46)
Water storage loss (or HIU loss):												
Store volume												200.0000
a) If manufacturer declared loss factor is known (kWh/day):												(47)
Temperature factor from Table 2b												1.3000
Enter (49) or (54) in (55)												0.5400
Total storage loss												(49)
21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(55)
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	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month												
256.7621	227.1419	241.6098	213.2893	207.3119	187.4238	185.4793	192.5318	194.2877	215.8971	228.6311	254.0829	(61)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h												
256.7621	227.1419	241.6098	213.2893	207.3119	187.4238	185.4793	192.5318	194.2877	215.8971	228.6311	254.0829	(63d)
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	(64)
Heat gains from water heating, kWh/month												
112.9839	100.4632	107.9458	97.6386	96.5417	89.0383	89.2824	91.6274	91.3205	99.3963	102.7397	112.0931	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = $\text{Sum}(64a)\text{m} =$												2604.4487
												2604

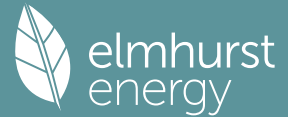
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
141.1686	156.2938	141.1686	145.8742	141.1686	145.8742	141.1686	141.1686	145.8742	141.1686	145.8742	141.1686	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
264.1364	266.8773	259.9703	245.2661	226.7047	209.2596	197.6052	194.8643	201.7713	216.4755	235.0369	252.4820	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	(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)												
-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	(71)
Water heating gains (Table 5)												
151.8601	149.4988	145.0884	135.6091	129.7604	123.6643	120.0032	123.1551	126.8341	133.5972	142.6941	150.6628	(72)
Total internal gains												
621.8815	637.3863	610.9437	591.4658	562.3501	543.5145	523.4934	523.9043	539.1959	555.9577	588.3215	609.0297	(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					
Northeast			8.3200	11.2829	0.4500	0.8000	0.7700	23.4197				(75)
Southeast			2.2700	36.7938	0.4500	0.8000	0.7700	20.8371				(77)
Southwest			4.3700	36.7938	0.4500	0.8000	0.7700	40.1137				(79)
Northwest			0.6100	11.2829	0.4500	0.8000	0.7700	1.7171				(81)
Solar gains	86.0875	154.9883	234.2393	327.4068	400.6526	412.6799	391.6565	334.7301	266.1437	177.2747	104.6335	72.6891
Total gains	707.9690	792.3746	845.1830	918.8726	963.0027	956.1944	915.1500	858.6345	805.3397	733.2324	692.9550	681.7188

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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	125.3578	125.7006	126.0454	127.7980	128.1544	129.9665	129.9665	130.3351	129.2356	128.1544	127.4436	126.7406
alpha	9.3572	9.3800	9.4030	9.5199	9.5436	9.6644	9.6644	9.6890	9.6157	9.5436	9.4962	9.4494
util living area	0.9975	0.9920	0.9733	0.8794	0.6872	0.4740	0.3406	0.3784	0.6083	0.9135	0.9907	0.9982 (86)
Living	20.6127	20.6992	20.8058	20.9238	20.9630	20.9676	20.9677	20.9678	20.9664	20.9145	20.7506	20.5992
Non living	19.9863	20.0732	20.1776	20.2898	20.3197	20.3308	20.3309	20.3326	20.3268	20.2858	20.1320	19.9791
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	20.8019	20.6992	20.8058	20.9238	20.9630	20.9676	20.9677	20.9678	20.9664	20.9145	20.7506	20.6553 (87)
Th 2	20.3411	20.3428	20.3445	20.3530	20.3546	20.3631	20.3631	20.3648	20.3597	20.3546	20.3513	20.3479 (88)
util rest of house	0.9966	0.9891	0.9641	0.8495	0.6421	0.4269	0.2913	0.3262	0.5529	0.8834	0.9867	0.9975 (89)
MIT 2	20.1596	20.0732	20.1776	20.2898	20.3197	20.3308	20.3309	20.3326	20.3268	20.2858	20.1320	20.0307 (90)
Living area fraction									fLA = Living area / (4) =			0.1899 (91)
MIT	20.2816	20.1921	20.2969	20.4102	20.4418	20.4518	20.4518	20.4533	20.4483	20.4052	20.2495	20.1493 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2816	20.1921	20.2969	20.4102	20.4418	20.4518	20.4518	20.4533	20.4483	20.4052	20.2495	20.1493 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9965	0.9883	0.9633	0.8523	0.6483	0.4335	0.2982	0.3335	0.5607	0.8860	0.9860	0.9972 (94)
Useful gains	705.4790	783.1031	814.1455	783.1532	624.3329	414.4940	272.8799	286.3365	451.5152	649.6736	683.2295	679.8435 (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	1173.8392	1120.1306	1007.8465	829.2763	628.0712	414.5670	272.8815	286.3411	452.2895	704.4707	950.0140	1158.6844 (97)
Space heating kWh	348.4601	226.4825	144.1136	33.2086	2.7814	0.0000	0.0000	0.0000	0.0000	40.7690	192.0849	356.2577 (98a)
Space heating requirement - total per year (kWh/year)												1344.1576
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	348.4601	226.4825	144.1136	33.2086	2.7814	0.0000	0.0000	0.0000	0.0000	40.7690	192.0849	356.2577 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1344.1576
Space heating per m2										(98c) / (4) =		12.8039 (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 %)												272.8307 (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	348.4601	226.4825	144.1136	33.2086	2.7814	0.0000	0.0000	0.0000	0.0000	40.7690	192.0849	356.2577 (98)
Space heating efficiency (main heating system 1)	272.8307	272.8307	272.8307	272.8307	272.8307	0.0000	0.0000	0.0000	0.0000	272.8307	272.8307	272.8307 (210)
Space heating fuel (main heating system)	127.7202	83.0121	52.8216	12.1719	1.0194	0.0000	0.0000	0.0000	0.0000	14.9430	70.4044	130.5783 (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	256.7621	227.1419	241.6098	213.2893	207.3119	187.4238	185.4793	192.5318	194.2877	215.8971	228.6311	254.0829 (64)
Efficiency of water heater (217)m	180.4922	180.4922	180.4922	180.4922	180.4922	180.4922	180.4922	180.4922	180.4922	180.4922	180.4922	180.4922 (216)
Fuel for water heating, kWh/month	142.2566	125.8458	133.8616	118.1709	114.8592	103.8404	102.7630	106.6704	107.6432	119.6157	126.6709	140.7722 (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	25.1364	22.7038	25.1364	24.3255	25.1364	24.3255	25.1364	25.1364	24.3255	25.1364	24.3255	25.1364 (231)
Lighting	30.0115	24.0763	21.6781	15.8823	12.2679	10.0230	11.1912	14.5468	18.8948	24.7910	28.0014	30.8456 (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												492.6709 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												180.4922
Water heating fuel used												1442.9699 (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)												295.9606 (230a)
Total electricity for the above, kWh/year												295.9606 (231)

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Electricity for lighting (calculated in Appendix L)	242.2101	(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	2473.8114	(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	492.6709	0.1583	78.0047	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1442.9699	0.1408	203.1518	(264)
Space and water heating			281.1566	(265)
Pumps, fans and electric keep-hot	295.9606	0.1387	41.0534	(267)
Energy for lighting	242.2101	0.1443	34.9584	(268)
Total CO2, kg/year			357.1684	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4000	(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	492.6709	1.5861	781.4211	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1442.9699	1.5206	2194.1434	(278)
Space and water heating			2975.5645	(279)
Pumps, fans and electric keep-hot	295.9606	1.5128	447.7292	(281)
Energy for lighting	242.2101	1.5338	371.5099	(282)
Total Primary energy kWh/year			3794.8036	(286)
Dwelling Primary energy Rate (DPER)			36.1500	(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	52.9600 (1b)	x 2.6000 (2b)	= 137.6960	(1b) - (3b)
First floor	52.0200 (1c)	x 2.4000 (2c)	= 124.8480	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.9800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 262.5440	(5)

2. Ventilation rate

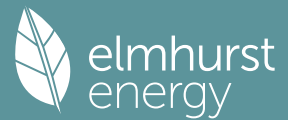
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1524 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4024	(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) =	0.3722 (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	0.4745	0.4652	0.4559	0.4094	0.4001	0.3536	0.3536	0.3443	0.3722	0.4001	0.4187	0.4373	(22b)
Effective ac	0.6126	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5593	0.5693	0.5800	0.5877	0.5956	(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			2.1500	1.0000	2.1500		(26)
TER Opening Type			15.5700	1.1450	17.8282		(27)
Heatloss Floor 1			52.9600	0.1300	6.8848		(28a)
Ext Wall	105.6900	17.7200	87.9700	0.1800	15.8346		(29a)
Roof	52.9600		52.9600	0.1100	5.8256		(30)
Total net area of external elements Aum(A, m2)			211.6100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5232		(33)
Main dwelling							
Ground			25.2200	0.0000	0.0000		(32)
First			23.2800	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							315.7440 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				5.2000	0.0900	0.4680	
E1 Steel lintel with perforated steel base plate				12.2100	0.0500	0.6105	
E3 Sill				11.1700	0.0500	0.5585	
E4 Jamb				33.3600	0.0500	1.6680	
E5 Ground floor (normal)				21.8200	0.1600	3.4912	
E6 Intermediate floor within a dwelling				20.4000	0.0000	0.0000	
E18 Party wall between dwellings				10.0000	0.0600	0.6000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3962 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	55.9194 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	53.0744	52.6956	52.3243	50.5804	50.2541	48.7352	48.7352	48.4540	49.3203	50.2541	50.9142	51.6042	(38)
Average = Sum(39)m / 12 =	108.9938	108.6150	108.2437	106.4998	106.1736	104.6547	104.6547	104.3734	105.2397	106.1736	106.8336	107.5237	(39)
												106.4983	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0382	1.0346	1.0311	1.0145	1.0114	0.9969	0.9969	0.9942	1.0025	1.0114	1.0177	1.0242	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

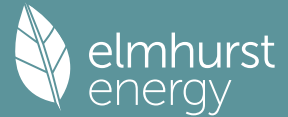
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7811 (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	124.8312	122.0499	118.7731	114.0542	110.1269	105.9428	104.5295	107.7943	111.2099	115.5772	120.3610	124.5549	(44)
Energy content (annual)	197.7021	173.7974	182.5498	156.1345	148.2520	130.2690	126.4194	133.4719	137.1329	156.8372	171.4763	195.0229	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1909.0653	
Water storage loss (or HIU loss):	29.6553	26.0696	27.3825	23.4202	22.2378	19.5403	18.9629	20.0208	20.5699	23.5256	25.7215	29.2534	(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	248.6282	219.7951	233.4759	205.4178	199.1780	179.5523	177.3454	184.3979	186.4162	207.7633	220.7596	245.9490	(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)	248.6282	219.7951	233.4759	205.4178	199.1780	179.5523	177.3454	184.3979	186.4162	207.7633	220.7596	245.9490	(64)
Electric shower(s)												2508.6788	(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)
	106.4768	94.5858	101.4387	91.3413	90.0346	82.7411	82.7753	85.1203	85.0233	92.8892	96.4425	105.5860	(65)
												2509	(64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

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

Metabolic gains (Table 5), Watts													
(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	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	139.0546	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.1686	156.2938	141.1686	145.8742	141.1686	145.8742	141.1686	141.1686	145.8742	141.1686	145.8742	141.1686	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	264.1364	266.8773	259.9703	245.2661	226.7047	209.2596	197.6052	194.8643	201.7713	216.4755	235.0369	252.4820	(68)
Pumps, fans	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	36.9055	(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)	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	-111.2437	(71)
Total internal gains	143.1140	140.7527	136.3423	126.8630	121.0143	114.9182	111.2571	114.4089	118.0879	124.8511	133.9479	141.9166	(72)
	616.1354	631.6402	605.1976	585.7197	556.6040	534.7684	514.7473	515.1582	530.4498	550.2116	582.5754	603.2836	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				8.3200	11.2829	0.6300	0.7000	0.7700	28.6891 (75)			
Southeast				2.2700	36.7938	0.6300	0.7000	0.7700	25.5254 (77)			
Southwest				4.3700	36.7938	0.6300	0.7000	0.7700	49.1392 (79)			
Northwest				0.6100	11.2829	0.6300	0.7000	0.7700	2.1034 (81)			
Solar gains	105.4572	189.8606	286.9431	401.0733	490.7995	505.5329	479.7793	410.0444	326.0261	217.1615	128.1760	89.0441 (83)
Total gains	721.5925	821.5008	892.1407	986.7930	1047.4035	1040.3012	994.5266	925.2026	856.4759	767.3731	710.7514	692.3277 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	84.4768	84.7714	85.0621	86.4550	86.7207	87.9793	87.9793	88.2164	87.4902	86.7207	86.1849	85.6318
util living area	6.6318	6.6514	6.6708	6.7637	6.7814	6.8653	6.8653	6.8811	6.8327	6.7814	6.7457	6.7088
	0.9987	0.9965	0.9899	0.9559	0.8444	0.6323	0.4618	0.5162	0.7903	0.9725	0.9964	0.9990 (86)
MIT	20.0545	20.1998	20.4091	20.7020	20.9111	20.9896	20.9989	20.9978	20.9574	20.6910	20.3299	20.0394 (87)
Th 2	20.0516	20.0546	20.0575	20.0713	20.0739	20.0859	20.0859	20.0882	20.0813	20.0739	20.0686	20.0632 (88)
util rest of house	0.9981	0.9951	0.9855	0.9371	0.7902	0.5477	0.3666	0.4155	0.7089	0.9569	0.9946	0.9986 (89)
MIT 2	18.9520	19.1398	19.4077	19.7779	20.0059	20.0810	20.0857	20.0876	20.0565	19.7730	19.3175	18.9416 (90)
Living area fraction									fLA = Living area /	(4) =		0.1899 (91)
MIT	19.1614	19.3412	19.5979	19.9534	20.1778	20.2536	20.2591	20.2604	20.2276	19.9474	19.5098	19.1501 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1614	19.3412	19.5979	19.9534	20.1778	20.2536	20.2591	20.2604	20.2276	19.9474	19.5098	19.1501 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9974	0.9935	0.9826	0.9342	0.7969	0.5636	0.3847	0.4347	0.7229	0.9542	0.9930	0.9980 (94)
Useful gains	719.7122	816.1642	876.6473	921.9024	834.7112	586.3143	382.6077	402.1807	619.1636	732.2003	705.7946	690.9410 (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	1619.8037	1568.5292	1417.7656	1177.1830	900.1183	591.6780	382.9440	402.9278	644.8663	992.4426	1325.7874	1607.4937 (97)
Space heating kWh	669.6680	505.5892	402.5920	183.8021	48.6629	0.0000	0.0000	0.0000	0.0000	193.6203	446.3948	681.9152 (98a)
Space heating requirement - total per year (kWh/year)												3132.2445
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	669.6680	505.5892	402.5920	183.8021	48.6629	0.0000	0.0000	0.0000	0.0000	193.6203	446.3948	681.9152 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3132.2445
Space heating per m2										(98c) / (4) =		29.8366 (99)

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

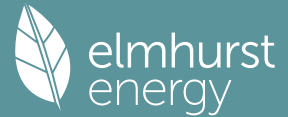
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (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	669.6680	505.5892	402.5920	183.8021	48.6629	0.0000	0.0000	0.0000	0.0000	193.6203	446.3948	681.9152	(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)	725.5342	547.7673	436.1777	199.1355	52.7225	0.0000	0.0000	0.0000	0.0000	209.7728	483.6346	738.8030	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	248.6282	219.7951	233.4759	205.4178	199.1780	179.5523	177.3454	184.3979	186.4162	207.7633	220.7596	245.9490	(64)
Efficiency of water heater	86.1688	85.8657	85.2700	83.8113	81.4203	79.8000	79.8000	79.8000	79.8000	83.9020	85.6053	79.8000	(216)
Fuel for water heating, kWh/month	288.5363	255.9756	273.8078	245.0955	244.6295	225.0029	222.2374	231.0751	233.6042	247.6262	257.8809	285.2496	(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	29.3320	23.5313	21.1873	15.5227	11.9902	9.7961	10.9379	14.2174	18.4670	24.2298	27.3675	30.1473	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-48.1395	-67.1495	-95.4904	-106.1506	-113.4064	-105.4241	-104.0706	-98.7386	-89.2068	-76.1707	-52.6490	-41.7000	(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)	-29.4043	-61.5987	-121.9840	-182.5889	-240.8613	-241.8522	-239.0513	-202.6981	-148.9323	-87.9352	-39.2026	-23.2755	(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)

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	3393.5476	1.1300	3834.7088 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3010.7210	1.1300	3402.1147 (278)
Space and water heating			7236.8235 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	236.7264	1.5338	363.0988 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-998.2962	1.4983	-1495.7719
PV Unit electricity exported	-1619.3845	0.4625	-748.9351
Total			-2244.7070 (283)
Total Primary energy kWh/year			5485.3162 (286)
Target Primary Energy Rate (TPER)			52.2500 (287)

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Plot Reference	Plot 66				Issued on Date	29/01/2026	
Assessment Reference	Plot 66			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	84 B	DER	3.59	TER	10.49		
Environmental	97 A	% DER < TER				65.78	
CO ₂ Emissions (t/year)	0.3	DFEE	33.09	TFEE	34.56		
Compliance Check	See BREL	% DFEE < TFEE				4.27	
% DPER < TPER	30.12	DPER	38.22	TPER	54.69		
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	46.0000 (1b)	x 2.6000 (2b)	= 119.6000 (1b) - (3b)
First floor	46.0000 (1c)	x 2.4000 (2c)	= 110.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 230.0000 (5)

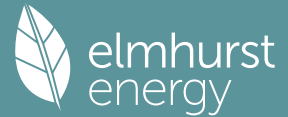
2. Ventilation rate

	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			13.8600	0.7752	10.7442		(27)
Front Door			2.1500	1.0000	2.1500		(26)
Heatloss Floor 1			46.0000	0.0700	3.2200	75.0000	3450.0000 (28a)
Ext Wall	95.5500	16.0100	79.5400	0.1400	11.1356	190.0000	15112.6006 (29a)
Roof	46.0000		46.0000	0.0900	4.1400	9.0000	414.0000 (30)
Total net area of external elements Aum (A, m ²)			187.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.3898		(33)
Main dwelling							
Ground			23.6900	0.0000	0.0000	180.0000	4264.2001 (32)
First			21.8600	0.0000	0.0000	180.0000	3934.8001 (32)
00 Internal Wall			90.7400			9.0000	816.6600 (32c)
01 Internal Wall			89.2800			9.0000	803.5200 (32c)
Internal Floor 1			46.0000			18.0000	828.0000 (32d)
Ground			46.0000			9.0000	414.0000 (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) = 30037.7808 (34)
326.4976 (35)
18.7550 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 50.1448 (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	15.1373	14.9618	14.7863	13.9087	13.7332	12.8556	12.8556	12.6800	13.2066	13.7332	14.0842	14.4352 (38)
Heat transfer coeff	65.2821	65.1066	64.9311	64.0535	63.8779	63.0003	63.0003	62.8248	63.3514	63.8779	64.2290	64.5800 (39)
Average = $\text{Sum}(39)\text{m} / 12 =$												64.0096
HLP	0.7096	0.7077	0.7058	0.6962	0.6943	0.6848	0.6848	0.6829	0.6886	0.6943	0.6981	0.7020 (40)
HLP (average)												0.6958
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6521 (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	79.2163	78.0398	76.3831	73.3284	71.0411	68.5048	67.1349	68.7800	70.5712	73.2851	76.4027	78.9485 (42b)
Hot water usage for other uses	41.7903	40.2707	38.7510	37.2314	35.7117	34.1921	34.1921	35.7117	37.2314	38.7510	40.2707	41.7903 (42c)
Average daily hot water use (litres/day)												111.4372 (43)
Daily hot water use	121.0066	118.3105	115.1342	110.5598	106.7528	102.6969	101.3269	104.4917	107.8026	112.0362	116.6734	120.7388 (44)
Energy conte	191.6449	168.4726	176.9569	151.3509	143.7098	126.2778	122.5462	129.3826	132.9314	152.0320	166.2227	189.0478 (45)
Energy content (annual)										Total = $\text{Sum}(45)\text{m} =$		1850.5758
Distribution loss (46)m = $0.15 \times (45)\text{m}$	28.7467	25.2709	26.5435	22.7026	21.5565	18.9417	18.3819	19.4074	19.9397	22.8048	24.9334	28.3572 (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	250.7049	221.8171	236.0169	208.5057	202.7698	183.4326	181.6061	188.4425	190.0862	211.0920	223.3775	248.1078 (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	250.7049	221.8171	236.0169	208.5057	202.7698	183.4326	181.6061	188.4425	190.0862	211.0920	223.3775	248.1078 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = $\text{Sum}(64)\text{m} =$		2545.9592 (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	110.9699	98.6927	106.0861	96.0480	95.0315	87.7112	87.9946	90.2677	89.9235	97.7986	100.9929	110.1064 (65)

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

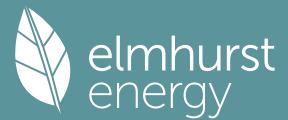
Metabolic gains (Table 5), Watts												
(66)m	132.6059	132.6059	132.6059	132.6059	132.6059	132.6059	132.6059	132.6059	132.6059	132.6059	132.6059	132.6059 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.2913	143.1440	129.2913	133.6010	129.2913	133.6010	129.2913	129.2913	133.6010	129.2913	133.6010	129.2913 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	242.7095	245.2280	238.8813	225.3699	208.3143	192.2843	181.5753	179.0568	185.4035	198.9148	215.9705	232.0005 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2606	36.2606	36.2606	36.2606	36.2606	36.2606	36.2606	36.2606	36.2606	36.2606	36.2606	36.2606 (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)	-106.0847	-106.0847	-106.0847	-106.0847	-106.0847	-106.0847	-106.0847	-106.0847	-106.0847	-106.0847	-106.0847	-106.0847 (71)
Water heating gains (Table 5)	149.1531	146.8642	142.5889	133.4000	127.7305	121.8211	118.2723	121.3275	124.8938	131.4498	140.2679	147.9924 (72)
Total internal gains	583.9357	598.0179	573.5433	555.1527	528.1178	510.4883	491.9207	492.4574	506.6801	522.4377	552.6212	572.0660 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				8.1300	11.2829	0.4500	0.8000	0.7700	22.8849 (75)			
Southeast				1.2900	36.7938	0.4500	0.8000	0.7700	11.8413 (77)			
Southwest				4.4400	36.7938	0.4500	0.8000	0.7700	40.7562 (79)			
Solar gains	75.4824	136.1759	206.5126	289.7219	355.4028	366.4203	347.6137	296.5355	235.0007	155.9473	91.7948	63.7015 (83)
Total gains	659.4181	734.1938	780.0559	844.8746	883.5207	876.9085	839.5344	788.9929	741.6807	678.3850	644.4160	635.7675 (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	127.8119	128.1565	128.5029	130.2635	130.6214	132.4410	132.4410	132.8110	131.7071	130.6214	129.9075	129.2014
alpha	9.5208	9.5438	9.5669	9.6842	9.7081	9.8294	9.8294	9.8541	9.7805	9.7081	9.6605	9.6134
util living area	0.9967	0.9897	0.9671	0.8627	0.6676	0.4597	0.3302	0.3663	0.5880	0.8968	0.9877	0.9976 (86)
Living	20.6415	20.7254	20.8266	20.9330	20.9647	20.9682	20.9683	20.9684	20.9674	20.9257	20.7746	20.6281
Non living	20.0061	20.0900	20.1883	20.2883	20.3121	20.3225	20.3226	20.3243	20.3187	20.2858	20.1464	19.9989
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	20.8166	20.7254	20.8266	20.9330	20.9647	20.9682	20.9683	20.9684	20.9674	20.9257	20.7746	20.6801 (87)
Th 2	20.3324	20.3341	20.3357	20.3442	20.3458	20.3543	20.3543	20.3560	20.3509	20.3458	20.3425	20.3391 (88)
util rest of house	0.9954	0.9860	0.9560	0.8304	0.6226	0.4134	0.2817	0.3150	0.5334	0.8631	0.9825	0.9966 (89)
MIT 2	20.1655	20.0900	20.1883	20.2883	20.3121	20.3225	20.3226	20.3243	20.3187	20.2858	20.1464	20.0465 (90)
Living area fraction									fLA = Living area / (4) =			0.1949 (91)
MIT	20.2924	20.2138	20.3127	20.4139	20.4393	20.4484	20.4484	20.4499	20.4451	20.4105	20.2688	20.1700 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2924	20.2138	20.3127	20.4139	20.4393	20.4484	20.4484	20.4499	20.4451	20.4105	20.2688	20.1700 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9953	0.9852	0.9556	0.8341	0.6291	0.4201	0.2888	0.3225	0.5414	0.8668	0.9818	0.9963 (94)
Useful gains	656.3342	723.3287	745.3839	704.6950	555.8469	368.4074	242.4506	254.4289	401.5125	588.0097	632.6794	633.4240 (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	1044.0147	997.0306	896.8712	737.5075	558.2477	368.4499	242.4515	254.4313	401.9737	626.6769	845.8182	1031.3415 (97)
Space heating kWh	288.4343	183.9277	112.7065	23.6250	1.7862	0.0000	0.0000	0.0000	0.0000	28.7684	153.4599	296.0506 (98a)
Space heating requirement - total per year (kWh/year)												1088.7586
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	288.4343	183.9277	112.7065	23.6250	1.7862	0.0000	0.0000	0.0000	0.0000	28.7684	153.4599	296.0506 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1088.7586
Space heating per m2										(98c) / (4) =		11.8343 (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 %)												270.8247 (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	288.4343	183.9277	112.7065	23.6250	1.7862	0.0000	0.0000	0.0000	0.0000	28.7684	153.4599	296.0506 (98)
Space heating efficiency (main heating system 1)	270.8247	270.8247	270.8247	270.8247	270.8247	0.0000	0.0000	0.0000	0.0000	270.8247	270.8247	270.8247 (210)
Space heating fuel (main heating system)	106.5022	67.9139	41.6160	8.7234	0.6595	0.0000	0.0000	0.0000	0.0000	10.6225	56.6639	109.3145 (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	250.7049	221.8171	236.0169	208.5057	202.7698	183.4326	181.6061	188.4425	190.0862	211.0920	223.3775	248.1078 (64)
Efficiency of water heater	180.4414	180.4414	180.4414	180.4414	180.4414	180.4414	180.4414	180.4414	180.4414	180.4414	180.4414	180.4414 (216)
Fuel for water heating, kWh/month	138.9398	122.9303	130.7997	115.5531	112.3743	101.6577	100.6455	104.4342	105.3451	116.9865	123.7950	137.5005 (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	22.0206	19.8895	22.0206	21.3102	22.0206	21.3102	22.0206	22.0206	21.3102	22.0206	21.3102	22.0206 (231)
Lighting	27.4865	22.0507	19.8542	14.5460	11.2358	9.1797	10.2496	13.3229	17.3051	22.7052	25.6455	28.2504 (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												402.0161 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												180.4414
Water heating fuel used												1410.9619 (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)												259.2744 (230a)
Total electricity for the above, kWh/year												259.2744 (231)
Electricity for lighting (calculated in Appendix L)												221.8317 (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	2294.0841 (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	402.0161	0.1586	63.7470 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1410.9619	0.1408	198.6210 (264)
Space and water heating			262.3680 (265)
Pumps, fans and electric keep-hot	259.2744	0.1387	35.9646 (267)
Energy for lighting	221.8317	0.1443	32.0172 (268)
Total CO2, kg/year			330.3498 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5900 (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	402.0161	1.5870	637.9840 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1410.9619	1.5205	2145.3812 (278)
Space and water heating			2783.3652 (279)
Pumps, fans and electric keep-hot	259.2744	1.5128	392.2303 (281)
Energy for lighting	221.8317	1.5338	340.2528 (282)
Total Primary energy kWh/year			3515.8484 (286)
Dwelling Primary energy Rate (DPER)			38.2200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	46.0000 (1b)	x 2.6000 (2b)	= 119.6000 (1b) - (3b)
First floor	46.0000 (1c)	x 2.4000 (2c)	= 110.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	230.0000 (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)

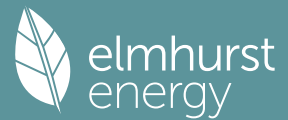
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1304 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3804	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3519 (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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135 (22b)
Effective ac	0.6007	0.5967	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (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			2.1500	1.0000	2.1500	(26)
TER Opening Type			13.8600	1.1450	15.8702	(27)
Heatloss Floor 1			46.0000	0.1300	5.9800	(28a)
Ext Wall	95.5500	16.0100	79.5400	0.1800	14.3172	(29a)
Roof	46.0000		46.0000	0.1100	5.0600	(30)
Total net area of external elements Aum(A, m2)			187.5500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	43.3774		(33)
Main dwelling						
Ground			23.6900	0.0000	0.0000	(32)
First			21.8600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 326.4976 (35)

List of Thermal Bridges												
K1 Element												
E1 Steel lintel with perforated steel base plate												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E18 Party wall between dwellings												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												6.9936 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 50.3710 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	45.5897	45.2930	45.0023	43.6364	43.3809	42.1913	42.1913	41.9710	42.6495	43.3809	43.8979	44.4383	(38)
Average = Sum(39)m / 12 =	95.9607	95.6641	95.3733	94.0075	93.7519	92.5624	92.5624	92.3421	93.0206	93.7519	94.2689	94.8093	(39)
												94.0063	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0431	1.0398	1.0367	1.0218	1.0190	1.0061	1.0061	1.0037	1.0111	1.0190	1.0247	1.0305	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

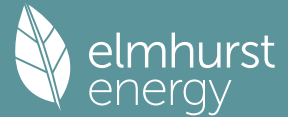
Assumed occupancy													2.6521 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	121.0066	118.3105	115.1342	110.5598	106.7528	102.6969	101.3269	104.4917	107.8026	112.0362	116.6734	120.7388	(44)
Energy content (annual)	191.6449	168.4726	176.9569	151.3509	143.7098	126.2778	122.5462	129.3826	132.9314	152.0320	166.2227	189.0478	(45)
Distribution loss (46)m = 0.15 x (45)m													
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													
If cylinder contains dedicated solar storage													
Primary loss													
Combi loss													
Total heat required for water heating calculated for each month													
WWHRS													
PV diverter													
Solar input													
FGHRS													
Output from w/h													
12Total per year (kWh/year)													
Electric shower(s)													
Heat gains from water heating, kWh/month													

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													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
Pumps, fans													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													

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		
Northeast				8.1300	11.2829	0.6300		0.7000	0.7700		28.0340 (75)		
Southeast				1.2900	36.7938	0.6300		0.7000	0.7700		14.5056 (77)		
Southwest				4.4400	36.7938	0.6300		0.7000	0.7700		49.9264 (79)		
Solar gains	92.4660	166.8155	252.9779	354.9093	435.3685	448.8648	425.8268	363.2560	287.8758	191.0355	112.4487	78.0343 (83)	
Total gains	670.6555	759.0873	820.7751	904.3160	957.7402	950.6070	909.0014	846.9673	785.8098	707.7271	659.3238	644.3542 (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	86.9504	87.2201	87.4860	88.7571	88.9990	90.1428	90.1428	90.3578	89.6987	88.9990	88.5109	88.0064	
alpha	6.7967	6.8147	6.8324	6.9171	6.9333	7.0095	7.0095	7.0239	6.9799	6.9333	6.9007	6.8671	
util living area													
	0.9984	0.9959	0.9883	0.9499	0.8294	0.6144	0.4472	0.4996	0.7713	0.9677	0.9956	0.9988 (86)	
MIT	20.1107	20.2521	20.4545	20.7337	20.9258	20.9920	20.9992	20.9984	20.9658	20.7225	20.3750	20.0935 (87)	
Th 2	20.0476	20.0503	20.0529	20.0652	20.0675	20.0782	20.0782	20.0802	20.0741	20.0675	20.0628	20.0580 (88)	
util rest of house													
	0.9978	0.9942	0.9831	0.9287	0.7723	0.5304	0.3540	0.4009	0.6875	0.9495	0.9934	0.9983 (89)	
MIT 2	19.0178	19.2002	19.4583	19.8078	20.0125	20.0747	20.0781	20.0798	20.0551	19.8028	19.3674	19.0039 (90)	
Living area fraction									fLA = Living area / (4) =				0.1949 (91)
MIT	19.2308	19.4052	19.6525	19.9882	20.1905	20.2535	20.2576	20.2588	20.2326	19.9820	19.5638	19.2162 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2308	19.4052	19.6525	19.9882	20.1905	20.2535	20.2576	20.2588	20.2326	19.9820	19.5638	19.2162 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9925	0.9802	0.9266	0.7805	0.5467	0.3722	0.4202	0.7029	0.9473	0.9918	0.9976 (94)	
Useful gains	668.6005	753.3994	804.5472	837.9347	747.5519	519.6838	338.3460	355.8618	552.3304	670.4509	653.8984	642.8265 (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	1432.7681	1387.6273	1254.3932	1042.3782	796.0034	523.2971	338.5553	356.3340	570.4553	879.5839	1174.9483	1423.6780 (97)	
Space heating kWh	568.5407	426.2011	334.6854	147.1993	36.0479	0.0000	0.0000	0.0000	0.0000	155.5949	375.1559	580.9535 (98a)	
Space heating requirement - total per year (kWh/year)												2624.3788	
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	568.5407	426.2011	334.6854	147.1993	36.0479	0.0000	0.0000	0.0000	0.0000	155.5949	375.1559	580.9535 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2624.3788	
Space heating per m2										(98c) / (4) =		28.5259 (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	568.5407	426.2011	334.6854	147.1993	36.0479	0.0000	0.0000	0.0000	0.0000	155.5949	375.1559	580.9535 (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)	615.9704	461.7564	362.6060	159.4792	39.0552	0.0000	0.0000	0.0000	0.0000	168.5752	406.4528	629.4187 (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	242.5710	214.4704	227.8830	200.6342	194.6359	175.5611	173.4722	180.3087	182.2147	202.9581	215.5060	239.9739 (64)	
Efficiency of water heater												79.8000 (216)	
(217)m	85.9026	85.5694	84.9204	83.3761	81.0842	79.8000	79.8000	79.8000	79.8000	83.4712	85.2904	85.9658 (217)	
Fuel for water heating, kWh/month	282.3790	250.6392	268.3490	240.6376	240.0418	220.0014	217.3838	225.9507	228.3392	243.1475	252.6733	279.1503 (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	26.8642	21.5514	19.4047	14.2167	10.9814	8.9719	10.0176	13.0212	16.9133	22.1912	25.0649	27.6108 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.4348	-59.5127	-85.0914	-95.1349	-102.1109	-95.1129	-93.9123	-88.8792	-79.9399	-67.7798	-46.5318	-36.7220 (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 FVs (Appendix M) (negative quantity)													
(233b)m	-24.9183	-52.3154	-103.8026	-155.6585	-205.5990	-206.5244	-204.1165	-172.9427	-126.9030	-74.7593	-33.2485	-19.7144 (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)	

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Annual totals kWh/year	
Space heating fuel - main system 1	2843.3140 (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	2948.6928 (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)	216.8093 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2273.6652 (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	3821.1508 (238)

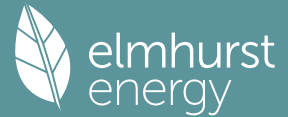
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2843.3140	0.2100	597.0959 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2948.6928	0.2100	619.2255 (264)
Space and water heating			1216.3214 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.8093	0.1443	31.2923 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-893.1625	0.1347	-120.3158
PV Unit electricity exported	-1380.5027	0.1259	-173.8602
Total			-294.1760 (269)
Total CO2, kg/year			965.3669 (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	2843.3140	1.1300	3212.9448 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2948.6928	1.1300	3332.0228 (278)
Space and water heating			6544.9676 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	216.8093	1.5338	332.5494 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-893.1625	1.4979	-1337.8355
PV Unit electricity exported	-1380.5027	0.4623	-638.1890
Total			-1976.0245 (283)
Total Primary energy kWh/year			5031.5933 (286)
Target Primary Energy Rate (TPER)			54.6900 (287)

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Plot Reference	Plot 67	Issued on Date	29/01/2026
Assessment Reference	Plot 67	Plot Type Ref	
Plot Address		SAP Version	10.2
SAP Rating	84 B	DER	3.59
Environmental	97 A	% DER < TER	66.45
CO ₂ Emissions (t/year)	0.31	DFEE	34.18
Compliance Check	See BREL	% DFEE < TFEE	4.18
% DPER < TPER	31.53	DPER	38.21
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	46.8200 (1b)	x 2.6000 (2b)	= 121.7320 (1b) - (3b)
First floor	46.8200 (1c)	x 2.4000 (2c)	= 112.3680 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.1000 (5)

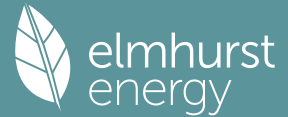
2. Ventilation rate

	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			13.8400	0.7752	10.7287		(27)
Front Door			2.1600	1.0000	2.1600		(26)
Heatloss Floor 1			46.8200	0.0700	3.2774	75.0000	3511.5000 (28a)
Ext Wall	103.1000	16.0000	87.1000	0.1400	12.1940	190.0000	16548.9997 (29a)
Roof	46.8200		46.8200	0.0900	4.2138	9.0000	421.3800 (30)
Total net area of external elements Aum (A, m ²)			196.7400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5739		(33)
Main dwelling							
Ground			20.6400	0.0000	0.0000	180.0000	3715.1999 (32)
First			19.0600	0.0000	0.0000	180.0000	3430.7999 (32)
00 Internal Wall			84.2400			9.0000	758.1600 (32c)
01 Internal Wall			86.1600			9.0000	775.4400 (32c)
Internal Floor 1			46.8200			18.0000	842.7600 (32d)
Ground			46.8200			9.0000	421.3800 (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) = 30425.6195 (34)
324.9212 (35)
19.6740 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 52.2479 (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	15.4071	15.2285	15.0498	14.1566	13.9780	13.0847	13.0847	12.9061	13.4420	13.9780	14.3353	14.6926 (38)
Heat transfer coeff	67.6550	67.4764	67.2977	66.4045	66.2258	65.3326	65.3326	65.1540	65.6899	66.2258	66.5831	66.9404 (39)
Average = $\text{Sum}(39)\text{m} / 12 =$												66.3598
HLP	0.7225	0.7206	0.7187	0.7091	0.7072	0.6977	0.6977	0.6958	0.7015	0.7072	0.7111	0.7149 (40)
HLP (average)												0.7087
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6723 (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	79.6089	78.4265	76.7616	73.6918	71.3931	68.8443	67.4675	69.1208	70.9209	73.6483	76.7813	79.3397 (42b)
Hot water usage for other uses	41.9974	40.4702	38.9431	37.4159	35.8887	34.3615	34.3615	35.8887	37.4159	38.9431	40.4702	41.9974 (42c)
Average daily hot water use (litres/day)												111.9894 (43)
Daily hot water use	121.6063	118.8968	115.7047	111.1077	107.2818	103.2058	101.8291	105.0095	108.3368	112.5914	117.2516	121.3371 (44)
Energy conte	192.5946	169.3074	177.8338	152.1008	144.4220	126.9036	123.1534	130.0237	133.5901	152.7854	167.0464	189.9846 (45)
Energy content (annual)										Total = $\text{Sum}(45)\text{m} =$		1859.7460
Distribution loss (46)m = $0.15 \times (45)\text{m}$	28.8892	25.3961	26.6751	22.8151	21.6633	19.0355	18.4730	19.5036	20.0385	22.9178	25.0570	28.4977 (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	251.6546	222.6519	236.8938	209.2556	203.4819	184.0584	182.2134	189.0837	190.7449	211.8454	224.2012	249.0446 (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	251.6546	222.6519	236.8938	209.2556	203.4819	184.0584	182.2134	189.0837	190.7449	211.8454	224.2012	249.0446 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = $\text{Sum}(64)\text{m} =$		2555.1294 (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	111.2857	98.9703	106.3777	96.2974	95.2683	87.9193	88.1965	90.4809	90.1426	98.0491	101.2668	110.4179 (65)

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

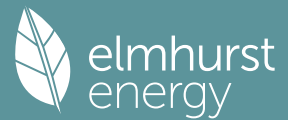
Metabolic gains (Table 5), Watts												
(66)m	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	131.3674	145.4424	131.3674	135.7463	131.3674	135.7463	131.3674	131.3674	135.7463	131.3674	135.7463	131.3674 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.6173	248.1661	241.7433	228.0701	210.8101	194.5881	183.7508	181.2020	187.6248	201.2980	218.5581	234.7801 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617 (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)	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936 (71)
Water heating gains (Table 5)	149.5775	147.2772	142.9808	133.7464	128.0488	122.1101	118.5437	121.6141	125.1980	131.7864	140.6483	148.4111 (72)
Total internal gains	589.6473	603.9709	579.1766	560.6478	533.3113	515.5295	496.7469	497.2685	511.6541	527.5369	558.0377	577.6436 (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			8.2500		10.6334		0.4500		0.8000		0.7700	21.8858 (74)
South			4.3000		46.7521		0.4500		0.8000		0.7700	50.1539 (78)
West			1.2900		19.6403		0.4500		0.8000		0.7700	6.3208 (80)
Solar gains	78.3605	136.3289	196.0645	262.1115	313.4067	320.4767	305.0428	264.9379	218.4322	153.0537	94.3297	66.7806 (83)
Total gains	668.0078	740.2997	775.2411	822.7593	846.7180	836.0063	801.7897	762.2065	730.0864	680.5907	652.3674	644.4242 (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	124.9214	125.2521	125.5846	127.2739	127.6173	129.3621	129.3621	129.7168	128.6584	127.6173	126.9324	126.2549
alpha	9.3281	9.3501	9.3723	9.4849	9.5078	9.6241	9.6241	9.6478	9.5772	9.5078	9.4622	9.4170
util living area	0.9969	0.9910	0.9738	0.8936	0.7174	0.4998	0.3585	0.3932	0.6184	0.9101	0.9889	0.9977 (86)
Living	20.6230	20.7053	20.8030	20.9164	20.9609	20.9674	20.9676	20.9677	20.9661	20.9157	20.7590	20.6097
Non living	19.9774	20.0600	20.1557	20.2642	20.2983	20.3104	20.3105	20.3122	20.3064	20.2669	20.1208	19.9704
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	20.8071	20.7053	20.8030	20.9164	20.9609	20.9674	20.9676	20.9677	20.9661	20.9157	20.7590	20.6643 (87)
Th 2	20.3210	20.3227	20.3244	20.3328	20.3344	20.3429	20.3429	20.3446	20.3395	20.3344	20.3311	20.3277 (88)
util rest of house	0.9958	0.9877	0.9645	0.8644	0.6700	0.4487	0.3050	0.3372	0.5604	0.8785	0.9842	0.9969 (89)
MIT 2	20.1452	20.0600	20.1557	20.2642	20.2983	20.3104	20.3105	20.3122	20.3064	20.2669	20.1208	20.0204 (90)
Living area fraction									fLA = Living area / (4) =			0.1933 (91)
MIT	20.2732	20.1847	20.2808	20.3903	20.4264	20.4374	20.4375	20.4389	20.4339	20.3923	20.2442	20.1448 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2732	20.1847	20.2808	20.3903	20.4264	20.4374	20.4375	20.4389	20.4339	20.3923	20.2442	20.1448 (93)

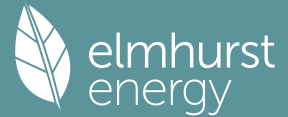
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9869	0.9638	0.8671	0.6767	0.4561	0.3127	0.3452	0.5688	0.8815	0.9834	0.9966 (94)
Useful gains	665.1173	730.5766	747.1515	713.4025	572.9654	381.2639	250.7110	263.1461	415.2529	599.9663	641.5664	642.2071 (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	1080.6656	1031.3596	927.4192	763.0081	577.9125	381.3726	250.7134	263.1522	416.0753	648.5056	875.1818	1067.3535 (97)
Space heating kWh	309.1679	202.1262	134.1191	35.7161	3.6807	0.0000	0.0000	0.0000	0.0000	36.1133	168.2031	316.3089 (98a)
Space heating requirement - total per year (kWh/year)												1205.4353
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	309.1679	202.1262	134.1191	35.7161	3.6807	0.0000	0.0000	0.0000	0.0000	36.1133	168.2031	316.3089 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1205.4353
Space heating per m2										(98c) / (4) =		12.8731 (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 %)												271.4619 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	309.1679	202.1262	134.1191	35.7161	3.6807	0.0000	0.0000	0.0000	0.0000	36.1133	168.2031	316.3089 (98)
Space heating efficiency (main heating system 1)	271.4619	271.4619	271.4619	271.4619	271.4619	0.0000	0.0000	0.0000	0.0000	271.4619	271.4619	271.4619 (210)
Space heating fuel (main heating system)	113.8900	74.4584	49.4062	13.1569	1.3559	0.0000	0.0000	0.0000	0.0000	13.3033	61.9620	116.5206 (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	251.6546	222.6519	236.8938	209.2556	203.4819	184.0584	182.2134	189.0837	190.7449	211.8454	224.2012	249.0446 (64)
Efficiency of water heater	180.4576	180.4576	180.4576	180.4576	180.4576	180.4576	180.4576	180.4576	180.4576	180.4576	180.4576	180.4576 (216)
Fuel for water heating, kWh/month	139.4536	123.3818	131.2739	115.9583	112.7589	101.9954	100.9730	104.7801	105.7007	117.3934	124.2404	138.0073 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	21.0547	19.0172	21.0547	20.3756	21.0547	20.3756	21.0547	21.0547	20.3756	21.0547	20.3756	21.0547 (231)
Lighting	27.9278	22.4047	20.1730	14.7796	11.4162	9.3271	10.4142	13.5368	17.5830	23.0698	26.0573	28.7040 (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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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												444.0533 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												180.4576
Water heating fuel used												1415.9166 (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)												247.9025 (230a)
Total electricity for the above, kWh/year												247.9025 (231)
Electricity for lighting (calculated in Appendix L)												225.3937 (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	2333.2661 (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	444.0533	0.1582	70.2553 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1415.9166	0.1408	199.3224 (264)
Space and water heating			269.5778 (265)
Pumps, fans and electric keep-hot	247.9025	0.1387	34.3871 (267)
Energy for lighting	225.3937	0.1443	32.5313 (268)
Total CO2, kg/year			336.4962 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5900 (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	444.0533	1.5857	704.1231 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1415.9166	1.5205	2152.9296 (278)
Space and water heating			2857.0527 (279)
Pumps, fans and electric keep-hot	247.9025	1.5128	375.0270 (281)
Energy for lighting	225.3937	1.5338	345.7163 (282)
Total Primary energy kWh/year			3577.7960 (286)
Dwelling Primary energy Rate (DPER)			38.2100 (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	46.8200 (1b)	x 2.6000 (2b)	= 121.7320 (1b) - (3b)
First floor	46.8200 (1c)	x 2.4000 (2c)	= 112.3680 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.1000 (5)

2. Ventilation rate

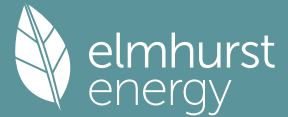
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1282 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3782 (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) = 0.3498 (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	0.4460	0.4372	0.4285	0.3848	0.3760	0.3323	0.3323	0.3236	0.3498	0.3760	0.3935	0.4110 (22b)
Effective ac	0.5994	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5523	0.5612	0.5707	0.5774	0.5845 (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			2.1600	1.0000	2.1600	(26)
TER Opening Type			13.8400	1.1450	15.8473	(27)
Heatloss Floor 1			46.8200	0.1300	6.0866	(28a)
Ext Wall	103.1000	16.0000	87.1000	0.1800	15.6780	(29a)
Roof	46.8200		46.8200	0.1100	5.1502	(30)
Total net area of external elements Aum(A, m2)			196.7400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.9221		(33)
Main dwelling						
Ground			20.6400	0.0000	0.0000	(32)
First			19.0600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 324.9212 (35)

List of Thermal Bridges												
K1 Element												
E1 Steel lintel with perforated steel base plate												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E18 Party wall between dwellings												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												7.6802 (36)
Point Thermal bridges												0.0000 (36a)
Total fabric heat loss												(33) + (36) + (36a) = 52.6023 (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	46.3093	46.0109	45.7185	44.3450	44.0880	42.8918	42.8918	42.6702	43.3525	44.0880	44.6079	45.1514 (38)
Average = Sum(39)m / 12 =	98.9116	98.6133	98.3208	96.9473	96.6904	95.4941	95.4941	95.2726	95.9549	96.6904	97.2102	97.7537 (39)
												96.9461
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0563	1.0531	1.0500	1.0353	1.0326	1.0198	1.0198	1.0174	1.0247	1.0326	1.0381	1.0439 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

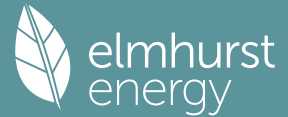
Assumed occupancy													2.6723 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	79.6089	78.4265	76.7616	73.6918	71.3931	68.8443	67.4675	69.1208	70.9209	73.6483	76.7813	79.3397	(42b)
Hot water usage for other uses	41.9974	40.4702	38.9431	37.4159	35.8887	34.3615	34.3615	35.8887	37.4159	38.9431	40.4702	41.9974	(42c)
Average daily hot water use (litres/day)													111.9894 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	121.6063	118.8968	115.7047	111.1077	107.2818	103.2058	101.8291	105.0095	108.3368	112.5914	117.2516	121.3371	(44)
Energy content (annual)	192.5946	169.3074	177.8338	152.1008	144.4220	126.9036	123.1534	130.0237	133.5901	152.7854	167.0464	189.9846	(45)
Distribution loss (46)m = 0.15 x (45)m	28.8892	25.3961	26.6751	22.8151	21.6633	19.0355	18.4730	19.5036	20.0385	22.9178	25.0570	28.4977	(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	243.5207	215.3052	228.7599	201.3841	195.3480	176.1869	174.0795	180.9498	182.8734	203.7115	216.3297	240.9107	(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	243.5207	215.3052	228.7599	201.3841	195.3480	176.1869	174.0795	180.9498	182.8734	203.7115	216.3297	240.9107	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2459.3594 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	104.7786	93.0929	99.8706	90.0002	88.7612	81.6221	81.6894	83.9737	83.8454	91.5420	94.9696	103.9108	(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	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	133.6169	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	131.3674	145.4424	131.3674	135.7463	131.3674	135.7463	131.3674	131.3674	135.7463	131.3674	135.7463	131.3674	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	245.6173	248.1661	241.7433	228.0701	210.8101	194.5881	183.7508	181.2020	187.6248	201.2980	218.5581	234.7801	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	36.3617	(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)	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	-106.8936	(71)
Water heating gains (Table 5)	140.8314	138.5311	134.2347	125.0002	119.3026	113.3640	109.7975	112.8679	116.4519	123.0403	131.9022	139.6650	(72)
Total internal gains	583.9012	598.2247	573.4305	554.9017	527.5652	506.7834	488.0008	488.5224	502.9080	521.7908	552.2916	571.8975	(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 Specific data or Table 6c	Access factor Table 6d	Gains W		
North	8.2500				10.6334	0.6300	0.7000	0.7700	0.7700	26.8100 (74)		
South	4.3000				46.7521	0.6300	0.7000	0.7700	0.7700	61.4386 (78)		
West	1.2900				19.6403	0.6300	0.7000	0.7700	0.7700	7.7430 (80)		
Solar gains	95.9916	167.0029	240.1790	321.0865	383.9232	392.5840	373.6775	324.5490	267.5795	187.4908	115.5539	81.8062 (83)
Total gains	679.8928	765.2276	813.6095	875.9882	911.4884	899.3674	861.6782	813.0714	770.4875	709.2816	667.8455	653.7037 (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	85.4456	85.7041	85.9590	87.1768	87.4085	88.5035	88.5035	88.7093	88.0785	87.4085	86.9411	86.4577
alpha	6.6964	6.7136	6.7306	6.8118	6.8272	6.9002	6.9002	6.9140	6.8719	6.8272	6.7961	6.7638
util living area	0.9985	0.9961	0.9900	0.9614	0.8663	0.6637	0.4859	0.5355	0.7981	0.9709	0.9958	0.9988 (86)
MIT	20.0869	20.2250	20.4175	20.6885	20.8967	20.9865	20.9986	20.9973	20.9555	20.7015	20.3543	20.0698 (87)
Th 2	20.0367	20.0393	20.0419	20.0540	20.0563	20.0669	20.0669	20.0688	20.0628	20.0563	20.0517	20.0469 (88)
util rest of house	0.9978	0.9945	0.9855	0.9439	0.8141	0.5747	0.3839	0.4292	0.7152	0.9541	0.9936	0.9983 (89)
MIT 2	18.9792	19.1575	19.4035	19.7466	19.9766	20.0606	20.0665	20.0681	20.0373	19.7691	19.3327	18.9653 (90)
Living area fraction	19.1933	19.3638	19.5995	19.9287	20.1544	20.2395	20.2467	20.2477	20.2148	19.9494	19.5302	19.1788 (92)
MIT	19.1933	19.3638	19.5995	19.9287	20.1544	20.2395	20.2467	20.2477	20.2148	19.9494	19.5302	19.1788 (93)
Temperature adjustment												0.0000
adjusted MIT	19.1933	19.3638	19.5995	19.9287	20.1544	20.2395	20.2467	20.2477	20.2148	19.9494	19.5302	19.1788 (93)
8. Space heating requirement												
Utilisation	0.9970	0.9929	0.9828	0.9411	0.8201	0.5917	0.4037	0.4499	0.7299	0.9516	0.9920	0.9976 (94)
Useful gains	677.8222	759.7591	799.5941	824.3900	747.5411	532.1544	347.8367	365.7653	562.3686	674.9823	662.4815	652.1532 (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	1473.1215	1426.3256	1287.9556	1069.2005	817.4609	538.5430	348.2370	366.5833	586.7424	903.9925	1208.3385	1464.2342 (97)
Space heating kWh	591.7027	447.9327	363.3409	176.2636	52.0203	0.0000	0.0000	0.0000	0.0000	170.3836	393.0171	604.1883 (98a)
Space heating requirement - total per year (kWh/year)												2798.8491
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	591.7027	447.9327	363.3409	176.2636	52.0203	0.0000	0.0000	0.0000	0.0000	170.3836	393.0171	604.1883 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2798.8491
Space heating per m2										(98c) / (4) =		29.8895 (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	591.7027	447.9327	363.3409	176.2636	52.0203	0.0000	0.0000	0.0000	0.0000	170.3836	393.0171	604.1883 (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)	641.0647	485.3008	393.6521	190.9681	56.3600	0.0000	0.0000	0.0000	0.0000	184.5977	425.8040	654.5918 (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	243.5207	215.3052	228.7599	201.3841	195.3480	176.1869	174.0795	180.9498	182.8734	203.7115	216.3297	240.9107 (64)
Efficiency of water heater	85.9729	85.6637	85.0922	83.7624	81.5379	79.8000	79.8000	79.8000	79.8000	83.6619	85.3814	79.8000 (216)
Fuel for water heating, kWh/month	283.2527	251.3378	268.8376	240.4232	239.5795	220.7856	218.1447	226.7541	229.1647	243.4937	253.3688	280.0182 (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	27.2955	21.8975	19.7163	14.4450	11.1577	9.1160	10.1784	13.2303	17.1849	22.5475	25.4674	28.0542 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-43.1279	-60.4516	-86.3850	-96.5226	-103.5482	-96.4302	-95.2111	-90.1339	-81.1083	-68.8211	-47.2795	-37.3256 (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)	-25.4258	-53.3700	-105.8762	-158.7415	-209.6469	-210.5841	-208.1304	-176.3553	-129.4218	-76.2589	-33.9231	-20.1169 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

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Annual totals kWh/year		
Space heating fuel - main system 1	3032.3393	(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	2955.1605	(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)	220.2907	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2314.1958	(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	3979.5947	(238)

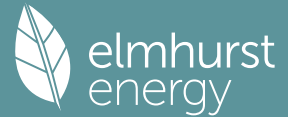
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3032.3393	0.2100	636.7912 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2955.1605	0.2100	620.5837 (264)
Space and water heating			1257.3750 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	220.2907	0.1443	31.7948 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-906.3449	0.1347	-122.1033
PV Unit electricity exported	-1407.8509	0.1259	-177.3111
Total			-299.4144 (269)
Total CO2, kg/year			1001.6846 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7000 (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	3032.3393	1.1300	3426.5434 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2955.1605	1.1300	3339.3314 (278)
Space and water heating			6765.8747 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	220.2907	1.5338	337.8892 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-906.3449	1.4979	-1357.6249
PV Unit electricity exported	-1407.8509	0.4623	-650.8564
Total			-2008.4813 (283)
Total Primary energy kWh/year			5225.3834 (286)
Target Primary Energy Rate (TPER)			55.8000 (287)

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Plot Reference	Plot 81			Issued on Date	29/01/2026
Assessment Reference	Plot 81	Plot Type Ref			
Plot Address				SAP Version	10.2
SAP Rating	84 B	DER	3.76	TER	11.10
Environmental	97 A	% DER < TER			66.13
CO ₂ Emissions (t/year)	0.28	DFEE	32.86	TFEE	34.56
Compliance Check	See BREL	% DFEE < TFEE			4.91
% DPER < TPER	30.72	DPER	40.10	TPER	57.88
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	40.2400 (1b)	x 2.6000 (2b)	= 104.6240 (1b) - (3b)
First floor	40.2400 (1c)	x 2.4000 (2c)	= 96.5760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 201.2000 (5)

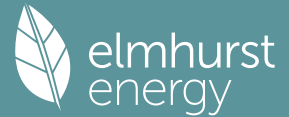
2. Ventilation rate

	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			13.3000	0.7752	10.3101		(27)
Front Door			2.1600	1.0000	2.1600		(26)
Heatloss Floor 1			40.2400	0.0700	2.8168	75.0000	3018.0000 (28a)
Ext Wall	89.5400	15.4600	74.0800	0.1400	10.3712	190.0000	14075.2002 (29a)
Roof	40.2400		40.2400	0.0900	3.6216	9.0000	362.1600 (30)
Total net area of external elements Aum (A, m ²)			170.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.2797		(33)
Main dwelling							
Ground			23.6300	0.0000	0.0000	180.0000	4253.3998 (32)
First			21.8100	0.0000	0.0000	180.0000	3925.7999 (32)
00 Internal Wall			49.5600			9.0000	446.0400 (32c)
01 Internal Wall			62.8800			9.0000	565.9200 (32c)
Internal Floor 1			40.2400			18.0000	724.3200 (32d)
Ground			40.2400			9.0000	362.1600 (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) = 27733.0000 (34)
344.5949 (35)
17.0020 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 46.2817 (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	13.2419	13.0883	12.9348	12.1671	12.0135	11.2458	11.2458	11.0923	11.5529	12.0135	12.3206	12.6277
Heat transfer coeff	59.5235	59.3700	59.2164	58.4487	58.2952	57.5275	57.5275	57.3740	57.8346	58.2952	58.6023	58.9094
Average = $\text{Sum}(39)\text{m} / 12 =$												58.4104
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7396	0.7377	0.7358	0.7263	0.7243	0.7148	0.7148	0.7129	0.7186	0.7243	0.7282	0.7320
HLP (average)												0.7258
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4719
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												
75.7179	74.5934	73.0099	70.0901	67.9038	65.4795	64.1700	65.7425	67.4547	70.0487	73.0286	75.4620	(42b)
Hot water usage for other uses												
39.9448	38.4922	37.0397	35.5872	34.1346	32.6821	32.6821	34.1346	35.5872	37.0397	38.4922	39.9448	(42c)
Average daily hot water use (litres/day)												106.5159
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.6627	113.0857	110.0496	105.6773	102.0384	98.1616	96.8521	99.8771	103.0418	107.0884	111.5209	115.4068
Energy conte	183.1815	161.0325	169.1421	144.6669	137.3633	120.7011	117.1343	123.6688	127.0609	145.3180	158.8819	180.6991
Energy content (annual)												(44)
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
27.4772	24.1549	25.3713	21.7000	20.6045	18.1052	17.5701	18.5503	19.0591	21.7977	23.8323	27.1049	(46)
Water storage loss (or HIU loss):												
Store volume												200.0000
a) If manufacturer declared loss factor is known (kWh/day):												(47)
Temperature factor from Table 2b												1.3000
Enter (49) or (54) in (55)												0.5400
Total storage loss												(49)
21.7620	19.6560	21.7620	21.0600	21.7620	21.0600	21.7620	21.7620	21.0600	21.7620	21.0600	21.7620	(55)
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	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month												
242.2415	214.3770	228.2021	201.8217	196.4233	177.8559	176.1942	182.7287	184.2157	204.3779	216.0367	239.7590	(61)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h												
242.2415	214.3770	228.2021	201.8217	196.4233	177.8559	176.1942	182.7287	184.2157	204.3779	216.0367	239.7590	(63d)
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	(64)
Heat gains from water heating, kWh/month												
108.1558	96.2189	103.4877	93.8256	92.9213	85.8570	86.1951	88.3678	87.9716	95.5662	98.5521	107.3304	(64a)
												(64b)
												(64c)
												(64d)
												(64e)
												(64f)
												(64g)
												(64h)
												(64i)
												(64j)
												(64k)
												(64l)
												(64m)
												(64n)
												(64o)
												(64p)
												(64q)
												(64r)
												(64s)
												(64t)
												(64u)
												(64v)
												(64w)
												(64x)
												(64y)
												(64z)
												(65)

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

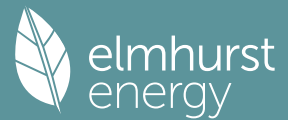
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
115.2763	127.6273	115.2763	119.1189	115.2763	119.1189	115.2763	115.2763	115.2763	119.1189	115.2763	119.1189	115.2763
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
220.4408	222.7283	216.9639	204.6922	189.2014	174.6422	164.9158	162.6283	168.3927	180.6644	196.1552	210.7144	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	(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)												
-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	(71)
Water heating gains (Table 5)												
145.3707	143.1829	139.0964	130.3133	124.8942	119.2458	115.8536	118.7740	122.1828	128.4492	136.8779	144.2613	(72)
Total internal gains												
541.1664	553.6171	531.4152	514.2029	489.4505	473.0854	456.1243	456.7571	469.7729	484.4685	512.2305	530.3306	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	g Specific data or Table 6c	FF		Access factor Table 6d		Gains W
Northeast				1.3500	11.2829	0.4500		0.8000		0.7700		3.8001 (75)
Southeast				7.4500	36.7938	0.4500		0.8000		0.7700		68.3860 (77)
Northwest				4.5000	11.2829	0.4500		0.8000		0.7700		12.6669 (81)
Solar gains	84.8530	150.0056	219.7727	296.6608	354.5121	361.7254	344.6732	300.0188	246.1640	169.7054	102.6304	71.9719 (83)
Total gains	626.0194	703.6227	751.1879	810.8638	843.9625	834.8109	800.7975	756.7760	715.9368	654.1739	614.8609	602.3025 (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	129.4213	129.7560	130.0924	131.8011	132.1483	133.9118	133.9118	134.2702	133.2008	132.1483	131.4558	130.7706
alpha	9.6281	9.6504	9.6728	9.7867	9.8099	9.9275	9.9275	9.9513	9.8801	9.8099	9.7637	9.7180
util living area	0.9957	0.9857	0.9548	0.8343	0.6394	0.4410	0.3161	0.3487	0.5566	0.8693	0.9835	0.9968 (86)
Living	20.6651	20.7536	20.8523	20.9430	20.9661	20.9685	20.9686	20.9687	20.9680	20.9375	20.7965	20.6499
Non living	20.0039	20.0918	20.1859	20.2695	20.2866	20.2964	20.2964	20.2981	20.2927	20.2684	20.1418	19.9951
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	20.8287	20.7536	20.8523	20.9430	20.9661	20.9685	20.9686	20.9687	20.9680	20.9375	20.7965	20.6989 (87)
Th 2	20.3060	20.3077	20.3093	20.3177	20.3194	20.3278	20.3278	20.3295	20.3244	20.3194	20.3160	20.3127 (88)
util rest of house	0.9939	0.9805	0.9399	0.7983	0.5939	0.3947	0.2678	0.2979	0.5025	0.8302	0.9764	0.9956 (89)
MIT 2	20.1515	20.0918	20.1859	20.2695	20.2866	20.2964	20.2964	20.2981	20.2927	20.2684	20.1418	20.0395 (90)
Living area fraction									fLA = Living area / (4) =			0.2258 (91)
MIT	20.3044	20.2412	20.3364	20.4216	20.4400	20.4481	20.4481	20.4495	20.4452	20.4195	20.2896	20.1884 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3044	20.2412	20.3364	20.4216	20.4400	20.4481	20.4481	20.4495	20.4452	20.4195	20.2896	20.1884 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9799	0.9406	0.8041	0.6020	0.4030	0.2764	0.3070	0.5122	0.8364	0.9761	0.9953 (94)
Useful gains	622.2073	689.4546	706.5443	651.9931	508.0646	336.4030	221.3731	232.3352	366.7266	547.1446	600.1389	599.4621 (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	952.6359	910.8092	819.3410	673.4204	509.4997	336.4272	221.3736	232.3364	366.9694	572.4272	772.9402	941.8648 (97)
Space heating kWh	245.8389	148.7503	83.9207	15.4277	1.0678	0.0000	0.0000	0.0000	0.0000	18.8103	124.4169	254.7476 (98a)
Space heating requirement - total per year (kWh/year)												892.9801
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	245.8389	148.7503	83.9207	15.4277	1.0678	0.0000	0.0000	0.0000	0.0000	18.8103	124.4169	254.7476 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												892.9801
Space heating per m2										(98c) / (4) =		11.0957 (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 %)												268.4896 (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	245.8389	148.7503	83.9207	15.4277	1.0678	0.0000	0.0000	0.0000	0.0000	18.8103	124.4169	254.7476 (98)
Space heating efficiency (main heating system 1)	268.4896	268.4896	268.4896	268.4896	268.4896	0.0000	0.0000	0.0000	0.0000	268.4896	268.4896	268.4896 (210)
Space heating fuel (main heating system)	91.5637	55.4026	31.2566	5.7461	0.3977	0.0000	0.0000	0.0000	0.0000	7.0060	46.3396	94.8817 (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	242.2415	214.3770	228.2021	201.8217	196.4233	177.8559	176.1942	182.7287	184.2157	204.3779	216.0367	239.7590 (64)
Efficiency of water heater	180.7225	180.7225	180.7225	180.7225	180.7225	180.7225	180.7225	180.7225	180.7225	180.7225	180.7225	180.7225 (216)
Fuel for water heating, kWh/month	134.0406	118.6222	126.2721	111.6749	108.6878	98.4138	97.4943	101.1101	101.9329	113.0894	119.5406	132.6670 (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	18.0957	16.3445	18.0957	17.5120	18.0957	17.5120	18.0957	18.0957	17.5120	18.0957	17.5120	18.0957 (231)
Lighting	24.5070	19.6604	17.7020	12.9693	10.0178	8.1847	9.1386	11.8787	15.4293	20.2440	22.8656	25.1881 (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												332.5939 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												180.7225
Water heating fuel used												1363.5455 (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)												213.0628 (230a)
Total electricity for the above, kWh/year												213.0628 (231)
Electricity for lighting (calculated in Appendix L)												197.7854 (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	2106.9877 (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	332.5939	0.1589	52.8616 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1363.5455	0.1407	191.9113 (264)
Space and water heating			244.7728 (265)
Pumps, fans and electric keep-hot	213.0628	0.1387	29.5544 (267)
Energy for lighting	197.7854	0.1443	28.5465 (268)
Total CO2, kg/year			302.8738 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	332.5939	1.5883	528.2589 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1363.5455	1.5204	2073.1531 (278)
Space and water heating			2601.4121 (279)
Pumps, fans and electric keep-hot	213.0628	1.5128	322.3213 (281)
Energy for lighting	197.7854	1.5338	303.3699 (282)
Total Primary energy kWh/year			3227.1033 (286)
Dwelling Primary energy Rate (DPER)			40.1000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	40.2400 (1b)	x 2.6000 (2b)	= 104.6240 (1b) - (3b)
First floor	40.2400 (1c)	x 2.4000 (2c)	= 96.5760 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	201.2000 (5)

2. Ventilation rate

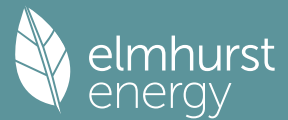
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1491 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3991 (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) = 0.3692 (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	0.4707	0.4615	0.4522	0.4061	0.3969	0.3507	0.3507	0.3415	0.3692	0.3969	0.4153	0.4338 (22b)
Effective ac	0.6108	0.6065	0.6023	0.5825	0.5787	0.5615	0.5615	0.5583	0.5681	0.5787	0.5862	0.5941 (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			2.1600	1.0000	2.1600	(26)
TER Opening Type			13.3000	1.1450	15.2290	(27)
Heatloss Floor 1			40.2400	0.1300	5.2312	(28a)
Ext Wall	89.5400	15.4600	74.0800	0.1800	13.3344	(29a)
Roof	40.2400		40.2400	0.1100	4.4264	(30)
Total net area of external elements Aum(A, m2)			170.0200			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	40.3810		(33)
Main dwelling						
Ground			23.6300	0.0000	0.0000	(32)
First			21.8100	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 344.5949 (35)

List of Thermal Bridges												
K1 Element												
E1 Steel lintel with perforated steel base plate												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E18 Party wall between dwellings												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												6.5066 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 46.8876 (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	40.5531	40.2675	39.9876	38.6726	38.4266	37.2814	37.2814	37.0693	37.7225	38.4266	38.9243	39.4446 (38)
Average = Sum(39)m / 12 =	87.4407	87.1551	86.8752	85.5603	85.3142	84.1690	84.1690	83.9569	84.6101	85.3142	85.8119	86.3322 (39)
												85.5591
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0865	1.0829	1.0795	1.0631	1.0601	1.0458	1.0458	1.0432	1.0513	1.0601	1.0663	1.0727 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

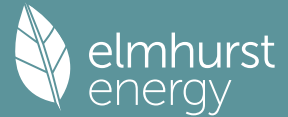
Assumed occupancy													2.4719 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	75.7179	74.5934	73.0099	70.0901	67.9038	65.4795	64.1700	65.7425	67.4547	70.0487	73.0286	75.4620	(42b)
Hot water usage for other uses	39.9448	38.4922	37.0397	35.5872	34.1346	32.6821	32.6821	34.1346	35.5872	37.0397	38.4922	39.9448	(42c)
Average daily hot water use (litres/day)													106.5159 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content	115.6627	113.0857	110.0496	105.6773	102.0384	98.1616	96.8521	99.8771	103.0418	107.0884	111.5209	115.4068	(44)
Energy content (annual)	183.1815	161.0325	169.1421	144.6669	137.3633	120.7011	117.1343	123.6688	127.0609	145.3180	158.8819	180.6991	(45)
Distribution loss (46)m = 0.15 x (45)m	27.4772	24.1549	25.3713	21.7000	20.6045	18.1052	17.5701	18.5503	19.0591	21.7977	23.8323	27.1049	(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	234.1076	207.0302	220.0682	193.9502	188.2894	169.9844	168.0603	174.5948	176.3442	196.2440	208.1652	231.6252	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	234.1076	207.0302	220.0682	193.9502	188.2894	169.9844	168.0603	174.5948	176.3442	196.2440	208.1652	231.6252	(64)
12Total per year (kWh/year)													2368.4637 (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	101.6487	90.3415	96.9806	87.5284	86.4142	79.5598	79.6880	81.8607	81.6744	89.0591	92.2549	100.8233	(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	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953	123.5953 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.2763	127.6273	115.2763	119.1189	115.2763	119.1189	115.2763	115.2763	119.1189	115.2763	119.1189	115.2763 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	220.4408	222.7283	216.9639	204.6922	189.2014	174.6422	164.9158	162.6283	168.3927	180.6644	196.1552	210.7144 (68)
Pumps, fans	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595	35.3595 (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)	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762	-98.8762 (71)
Total internal gains	136.6246	134.4368	130.3503	121.5672	116.1481	110.4997	107.1075	110.0279	113.4366	119.7031	128.1318	135.5152 (72)
	535.4203	547.8710	525.6691	508.4568	483.7043	464.3393	447.3782	448.0110	461.0267	478.7223	506.4844	524.5845 (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	
Northeast				1.3500	11.2829	0.6300		0.7000	0.7700		4.6551 (75)	
Southeast				7.4500	36.7938	0.6300		0.7000	0.7700		83.7728 (77)	
Northwest				4.5000	11.2829	0.6300		0.7000	0.7700		15.5170 (81)	

Solar gains	103.9449	183.7569	269.2215	363.4095	434.2773	443.1137	422.2246	367.5230	301.5508	207.8891	125.7222	88.1656 (83)
Total gains	639.3652	731.6279	794.8906	871.8663	917.9816	907.4530	869.6028	815.5341	762.5776	686.6115	632.2066	612.7501 (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	88.1009	88.3896	88.6745	90.0373	90.2969	91.5255	91.5255	91.7568	91.0484	90.2969	89.7732	89.2321
alpha	6.8734	6.8926	6.9116	7.0025	7.0198	7.1017	7.1017	7.1171	7.0699	7.0198	6.9849	6.9488
util living area	0.9981	0.9946	0.9843	0.9366	0.8032	0.5876	0.4253	0.4723	0.7349	0.9571	0.9944	0.9985 (86)
MIT	20.1495	20.3008	20.5057	20.7730	20.9417	20.9943	20.9995	20.9990	20.9757	20.7611	20.4147	20.1309 (87)
Th 2	20.0119	20.0148	20.0176	20.0311	20.0336	20.0453	20.0453	20.0475	20.0408	20.0336	20.0285	20.0232 (88)
util rest of house	0.9972	0.9922	0.9772	0.9101	0.7412	0.5031	0.3334	0.3753	0.6469	0.9331	0.9914	0.9979 (89)
MIT 2	19.0345	19.2293	19.4893	19.8195	19.9928	20.0429	20.0452	20.0472	20.0284	19.8149	19.3860	19.0195 (90)
Living area fraction	fLA = Living area / (4) = 0.2258 (91)											
MIT	19.2862	19.4712	19.7188	20.0347	20.2070	20.2577	20.2607	20.2621	20.2422	20.0285	19.6183	19.2704 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2862	19.4712	19.7188	20.0347	20.2070	20.2577	20.2607	20.2621	20.2422	20.0285	19.6183	19.2704 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9904	0.9744	0.9102	0.7531	0.5222	0.3542	0.3973	0.6664	0.9330	0.9897	0.9972 (94)
Useful gains	636.9967	724.6070	774.5405	793.6153	691.3315	473.8695	307.9879	323.9757	508.1705	640.5970	625.6993	611.0143 (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	1310.4083	1269.9586	1148.3865	952.6920	725.7716	476.2049	308.1134	324.2513	519.6945	804.3871	1074.2152	1301.0653 (97)
Space heating kWh	501.0183	366.4763	278.1414	114.5352	25.6234	0.0000	0.0000	0.0000	0.0000	121.8599	322.9315	513.3980 (98a)
Space heating requirement - total per year (kWh/year)	2243.9840											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000											
Space heating kWh	501.0183	366.4763	278.1414	114.5352	25.6234	0.0000	0.0000	0.0000	0.0000	121.8599	322.9315	513.3980 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2243.9840											
Space heating per m2	(98c) / (4) = 27.8825 (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	501.0183	366.4763	278.1414	114.5352	25.6234	0.0000	0.0000	0.0000	0.0000	121.8599	322.9315	513.3980 (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)	542.8150	397.0491	301.3450	124.0901	27.7610	0.0000	0.0000	0.0000	0.0000	132.0259	349.8716	556.2275 (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	234.1076	207.0302	220.0682	193.9502	188.2894	169.9844	168.0603	174.5948	176.3442	196.2440	208.1652	231.6252 (64)
Water heating requirement	85.7212	85.3261	84.5861	82.9203	80.7807	79.8000	79.8000	79.8000	79.8000	83.0235	85.0407	79.8000 (216)
Efficiency of water heater (217)m	273.1035	242.6341	260.1706	233.8995	233.0871	213.0131	210.6019	218.7905	220.9827	236.3718	244.7829	269.9851 (219)
Fuel for 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 (221)
Space cooling fuel requirement (221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Pumps and Fa	23.9521	19.2153	17.3012	12.6756	9.7910	7.9994	8.9317	11.6098	15.0799	19.7857	22.3479	24.6178 (232)
Lighting	-37.4914	-52.7737	-75.7412	-85.0266	-91.5711	-85.4269	-84.3646	-79.6964	-71.4450	-60.2758	-41.1858	-32.4226 (233a)
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 (234a)
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	-21.4279	-45.0516	-89.4999	-134.3631	-177.6081	-178.4402	-176.3459	-149.3409	-109.4976	-64.4149	-28.6047	-16.9471 (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)

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Annual totals kWh/year	
Space heating fuel - main system 1	2431.1852 (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	2857.4228 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	193.3075 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1988.9629 (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	3578.9526 (238)

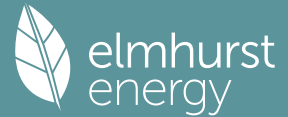
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2431.1852	0.2100	510.5489 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2857.4228	0.2100	600.0588 (264)
Space and water heating			1110.6077 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.3075	0.1443	27.9002 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-797.4210	0.1346	-107.3489
PV Unit electricity exported	-1191.5419	0.1259	-150.0251
Total			-257.3740 (269)
Total CO2, kg/year			893.0632 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2431.1852	1.1300	2747.2393 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2857.4228	1.1300	3228.8878 (278)
Space and water heating			5976.1271 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.3075	1.5338	296.5015 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-797.4210	1.4975	-1194.1659
PV Unit electricity exported	-1191.5419	0.4622	-550.6960
Total			-1744.8618 (283)
Total Primary energy kWh/year			4657.8675 (286)
Target Primary Energy Rate (TPER)			57.8800 (287)

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Plot Reference	Plot 98	Issued on Date	29/01/2026
Assessment Reference	Plot 98	Plot Type Ref	
Plot Address		SAP Version	10.2
SAP Rating	83 B	DER	3.96
Environmental	97 A	% DER < TER	67.14
CO ₂ Emissions (t/year)	0.34	DFEE	40.54
Compliance Check	See BREL	% DFEE < TFEE	3.38
% DPER < TPER	33.49	DPER	41.94
		TPER	63.06
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	46.4800 (1b)	x 2.6000 (2b)	= 120.8480 (1b) - (3b)
First floor	46.4800 (1c)	x 2.4000 (2c)	= 111.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 232.4000 (5)

2. Ventilation rate

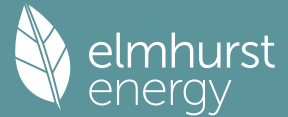
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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			15.0500	0.7752	11.6667		(27)
Front Door			2.1100	1.0000	2.1100		(26)
Heatloss Floor 1			46.4800	0.0700	3.2536	75.0000	3486.0000 (28a)
Ext Wall	142.2900	17.1600	125.1300	0.1400	17.5182	190.0000	23774.6987 (29a)
Roof	46.4800		46.4800	0.0900	4.1832	9.0000	418.3200 (30)
Total net area of external elements Aum(A, m ²)			235.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.7317		(33)
Main dwelling							
00 Internal Wall			82.6800			9.0000	744.1200 (32c)
01 Internal Wall			79.2000			9.0000	712.8000 (32c)
Internal Floor 1			46.4800			18.0000	836.6400 (32d)
Ground			46.4800			9.0000	418.3200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	30390.8987 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 326.9245 (35)
Thermal bridges (User defined value 0.100 * total exposed area) 23.5250 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.2567 (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	16.0286	15.8369	15.6452	14.6865	14.4948	13.5361	13.5361	13.3444	13.9196	14.4948	14.8782	15.2617 (38)
Heat transfer coeff	78.2853	78.0936	77.9018	76.9432	76.7515	75.7928	75.7928	75.6011	76.1763	76.7515	77.1349	77.5184 (39)
Average = Sum(39)m / 12 =												76.8953
HLP	0.8421	0.8401	0.8380	0.8277	0.8256	0.8153	0.8153	0.8133	0.8195	0.8256	0.8298	0.8339 (40)
HLP (average)												0.8272
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6641 (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	79.4491	78.2691	76.6075	73.5439	71.2498	68.7061	67.3321	68.9821	70.7786	73.5005	76.6272	79.1805	(42b)
Hot water usage for other uses	41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)
Average daily hot water use (litres/day)													111.7646 (43)
Daily hot water use	121.3622	118.6581	115.4724	110.8846	107.0665	102.9986	101.6247	104.7987	108.1194	112.3653	117.0162	121.0936	(44)
Energy conte	192.2080	168.9676	177.4768	151.7955	144.1321	126.6489	122.9062	129.7627	133.3220	152.4787	166.7111	189.6033	(45)
Energy content (annual)													Total = Sum(45)m = 1856.0129
Distribution loss (46)m = 0.15 x (45)m	28.8312	25.3451	26.6215	22.7693	21.6198	18.9973	18.4359	19.4644	19.9983	22.8718	25.0067	28.4405	(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	251.2680	222.3121	236.5368	208.9503	203.1920	183.8037	181.9662	188.8227	190.4768	211.5387	223.8659	248.6632	(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	251.2680	222.3121	236.5368	208.9503	203.1920	183.8037	181.9662	188.8227	190.4768	211.5387	223.8659	248.6632	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2551.3963 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	111.1571	98.8573	106.2590	96.1959	95.1719	87.8346	88.1143	90.3941	90.0534	97.9471	101.1553	110.2911	(65)

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

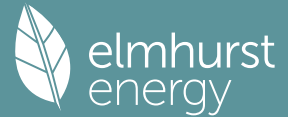
Metabolic gains (Table 5), Watts													
(66)m	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3203	142.0689	128.3203	132.5976	128.3203	132.5976	128.3203	128.3203	132.5976	128.3203	132.5976	128.3203	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4192	246.9555	240.5641	226.9575	209.7817	193.6388	182.8544	180.3181	186.7095	200.3161	217.4919	233.6348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	(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)	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)	149.4047	147.1091	142.8213	133.6054	127.9192	121.9925	118.4332	121.4974	125.0742	131.6494	140.4934	148.2407	(72)
Total internal gains	585.1058	599.0951	574.6672	556.1221	528.9828	511.1905	492.5695	493.0974	507.3429	523.2473	553.5446	573.1573	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast				8.1700	11.2829	0.4500	0.8000	0.7700	22.9975 (75)				
Southeast				1.2500	36.7938	0.4500	0.8000	0.7700	11.4742 (77)				
Southwest				4.2000	36.7938	0.4500	0.8000	0.7700	38.5532 (79)				
Northwest				1.4300	11.2829	0.4500	0.8000	0.7700	4.0253 (81)				
Solar gains	77.0501	140.2206	215.6975	307.2216	380.5892	393.8813	373.0667	315.8783	247.0056	161.4019	93.9228	64.8811	(83)
Total gains	662.1559	739.3157	790.3647	863.3437	909.5720	905.0719	865.6362	808.9757	754.3485	684.6493	647.4674	638.0384	(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	107.8353	108.1000	108.3661	109.7162	109.9903	111.3815	111.3815	111.6640	110.8208	109.9903	109.4435	108.9021
alpha	8.1890	8.2067	8.2244	8.3144	8.3327	8.4254	8.4254	8.4443	8.3881	8.3327	8.2962	8.2601
util living area	0.9981	0.9947	0.9835	0.9231	0.7597	0.5346	0.3852	0.4297	0.6862	0.9480	0.9939	0.9986 (86)
Living	20.4910	20.5817	20.7053	20.8647	20.9460	20.9622	20.9630	20.9630	20.9571	20.8537	20.6496	20.4771
Non living	19.7523	19.8438	19.9663	20.1208	20.1847	20.2028	20.2031	20.2049	20.1970	20.1158	19.9193	19.7448
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	20.7396	20.5817	20.7053	20.8647	20.9460	20.9622	20.9630	20.9630	20.9571	20.8537	20.6496	20.5503 (87)
Th 2	20.2170	20.2187	20.2205	20.2294	20.2312	20.2401	20.2401	20.2419	20.2365	20.2312	20.2276	20.2241 (88)
util rest of house	0.9973	0.9926	0.9768	0.8969	0.7062	0.4719	0.3187	0.3590	0.6154	0.9238	0.9910	0.9980 (89)
MIT 2	19.9792	19.8438	19.9663	20.1208	20.1847	20.2028	20.2031	20.2049	20.1970	20.1158	19.9193	19.8118 (90)
Living area fraction												
MIT	20.1263	19.9865	20.1092	20.2647	20.3320	20.3497	20.3501	20.3516	20.3440	20.2585	20.0606	19.9546 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1263	19.9865	20.1092	20.2647	20.3320	20.3497	20.3501	20.3516	20.3440	20.2585	20.0606	19.9546 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9918	0.9756	0.8982	0.7135	0.4810	0.3283	0.3692	0.6256	0.9248	0.9902	0.9978 (94)
Useful gains	660.3275	733.2187	771.1163	775.4970	648.9824	435.3058	284.2125	298.7009	471.9252	633.1509	641.1467	636.6067 (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	1238.9679	1178.1582	1060.1833	874.4365	662.5155	435.7846	284.2286	298.7428	475.6455	741.3071	999.7132	1221.2742 (97)
Space heating kWh	430.5085	298.9993	215.0659	71.2364	10.0686	0.0000	0.0000	0.0000	0.0000	80.4682	258.1679	434.9926 (98a)
Space heating requirement - total per year (kWh/year)												1799.5075
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	430.5085	298.9993	215.0659	71.2364	10.0686	0.0000	0.0000	0.0000	0.0000	80.4682	258.1679	434.9926 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1799.5075
Space heating per m2										(98c) / (4) =		19.3579 (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 %)												273.8664 (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	430.5085	298.9993	215.0659	71.2364	10.0686	0.0000	0.0000	0.0000	0.0000	80.4682	258.1679	434.9926 (98)
Space heating efficiency (main heating system 1)	273.8664	273.8664	273.8664	273.8664	273.8664	0.0000	0.0000	0.0000	0.0000	273.8664	273.8664	273.8664 (210)
Space heating fuel (main heating system)	157.1966	109.1771	78.5295	26.0114	3.6765	0.0000	0.0000	0.0000	0.0000	29.3823	94.2678	158.8339 (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	251.2680	222.3121	236.5368	208.9503	203.1920	183.8037	181.9662	188.8227	190.4768	211.5387	223.8659	248.6632 (64)
Efficiency of water heater (217)m	180.5182	180.5182	180.5182	180.5182	180.5182	180.5182	180.5182	180.5182	180.5182	180.5182	180.5182	180.5182 (216)
Fuel for water heating, kWh/month	139.1926	123.1521	131.0321	115.7503	112.5604	101.8200	100.8021	104.6003	105.5166	117.1841	124.0129	137.7497 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	20.9018	18.8791	20.9018	20.2276	20.9018	20.2276	20.9018	20.9018	20.2276	20.9018	20.2276	20.9018 (231)
Lighting	27.2800	21.8851	19.7051	14.4368	11.1514	9.1108	10.1727	13.2228	17.1751	22.5347	25.4529	28.0382 (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												657.0750 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												180.5182
Water heating fuel used												1413.3732 (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)												246.1023 (230a)
Total electricity for the above, kWh/year												246.1023 (231)
Electricity for lighting (calculated in Appendix L)												220.1656 (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	2536.7161 (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	657.0750	0.1574	103.4317 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1413.3732	0.1408	198.9628 (264)
Space and water heating			302.3944 (265)
Pumps, fans and electric keep-hot	246.1023	0.1387	34.1374 (267)
Energy for lighting	220.1656	0.1443	31.7767 (268)
Total CO2, kg/year			368.3086 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	657.0750	1.5827	1039.9763 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1413.3732	1.5205	2149.0563 (278)
Space and water heating			3189.0326 (279)
Pumps, fans and electric keep-hot	246.1023	1.5128	372.3036 (281)
Energy for lighting	220.1656	1.5338	337.6974 (282)
Total Primary energy kWh/year			3899.0335 (286)
Dwelling Primary energy Rate (DPER)			41.9400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	46.4800 (1b)	x 2.6000 (2b)	= 120.8480 (1b) - (3b)
First floor	46.4800 (1c)	x 2.4000 (2c)	= 111.5520 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	92.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 232.4000 (5)

2. Ventilation rate

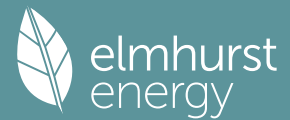
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1291 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3791 (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) = 0.3791 (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	0.4833	0.4739	0.4644	0.4170	0.4075	0.3601	0.3601	0.3507	0.3791	0.4075	0.4265	0.4454 (22b)
Effective ac	0.6168	0.6123	0.6078	0.5869	0.5830	0.5648	0.5648	0.5615	0.5719	0.5830	0.5909	0.5992 (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			2.1100	1.0000	2.1100		(26)

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TER Opening Type			15.0500	1.1450	17.2328	(27)
Heatloss Floor 1			46.4800	0.1300	6.0424	(28a)
Ext Wall	142.2900	17.1600	125.1300	0.1800	22.5234	(29a)
Roof	46.4800		46.4800	0.1100	5.1128	(30)
Total net area of external elements Aum(A, m2)			235.2500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	53.0214		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 326.9245 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	12.3500	0.0500	0.6175
E3 Sill	11.3000	0.0500	0.5650
E4 Jamb	29.3200	0.0500	1.4660
E5 Ground floor (normal)	28.4600	0.1600	4.5536
E6 Intermediate floor within a dwelling	28.4600	0.0000	0.0000
E16 Corner (normal)	20.0000	0.0900	1.8000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.0021 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 62.0235 (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	47.3042	46.9563	46.6154	45.0138	44.7142	43.3193	43.3193	43.0610	43.8566	44.7142	45.3204	45.9541	(38)
Heat transfer coeff	109.3277	108.9799	108.6389	107.0374	106.7377	105.3428	105.3428	105.0845	105.8801	106.7377	107.3439	107.9776	(39)
Average = Sum(39)m / 12 =												107.0359	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1761	1.1723	1.1687	1.1514	1.1482	1.1332	1.1332	1.1304	1.1390	1.1482	1.1547	1.1615	(40)
HLP (average)												1.1514	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6641 (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	79.4491	78.2691	76.6075	73.5439	71.2498	68.7061	67.3321	68.9821	70.7786	73.5005	76.6272	79.1805	(42b)
Hot water usage for other uses	41.9131	40.3890	38.8649	37.3408	35.8167	34.2926	34.2926	35.8167	37.3408	38.8649	40.3890	41.9131	(42c)
Average daily hot water use (litres/day)												111.7646	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.3622	118.6581	115.4724	110.8846	107.0665	102.9986	101.6247	104.7987	108.1194	112.3653	117.0162	121.0936	(44)
Energy conte	192.2080	168.9676	177.4768	151.7955	144.1321	126.6489	122.9062	129.7627	133.3220	152.4787	166.7111	189.6033	(45)
Energy content (annual)										Total = Sum(45)m =		1856.0129	(45)
Distribution loss (46)m = 0.15 x (45)m	28.8312	25.3451	26.6215	22.7693	21.6198	18.9973	18.4359	19.4644	19.9983	22.8718	25.0067	28.4405	(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	243.1341	214.9653	228.4029	201.0788	195.0581	175.9321	173.8323	180.6888	182.6053	203.4048	215.9944	240.5294	(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	243.1341	214.9653	228.4029	201.0788	195.0581	175.9321	173.8323	180.6888	182.6053	203.4048	215.9944	240.5294	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2455.6263	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	104.6500	92.9799	99.7519	89.8987	88.6648	81.5374	81.6072	83.8870	83.7562	91.4400	94.8581	103.7839	(65)

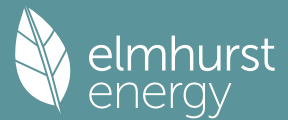
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	133.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3203	142.0689	128.3203	132.5976	128.3203	132.5976	128.3203	128.3203	132.5976	128.3203	132.5976	128.3203	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4192	246.9555	240.5641	226.9575	209.7817	193.6388	182.8544	180.3181	186.7095	200.3161	217.4919	233.6348	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	36.3205	(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)	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	-106.5643	(71)
Water heating gains (Table 5)	140.6586	138.3630	134.0751	124.8592	119.1731	113.2464	109.6871	112.7513	116.3280	122.9033	131.7473	139.4946	(72)
Total internal gains	579.3597	593.3490	568.9211	550.3760	523.2367	502.4444	483.8234	484.3513	498.5968	517.5012	547.7985	567.4112	(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
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Northeast			8.1700		11.2829		0.6300		0.7000		0.7700		28.1719 (75)
Southeast			1.2500		36.7938		0.6300		0.7000		0.7700		14.0558 (77)
Southwest			4.2000		36.7938		0.6300		0.7000		0.7700		47.2276 (79)
Northwest			1.4300		11.2829		0.6300		0.7000		0.7700		4.9309 (81)

Solar gains	94.3863	171.7702	264.2294	376.3464	466.2218	482.5046	457.0067	386.9509	302.5819	197.7174	115.0554	79.4793 (83)
Total gains	673.7460	765.1192	833.1505	926.7224	989.4585	984.9491	940.8301	871.3022	801.1787	715.2186	662.8539	646.8905 (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	77.2166	77.4631	77.7062	78.8689	79.0903	80.1375	80.1375	80.3345	79.7309	79.0903	78.6437	78.1821	
alpha	6.1478	6.1642	6.1804	6.2579	6.2727	6.3425	6.3425	6.3556	6.3154	6.2727	6.2429	6.2121	
util living area	0.9986	0.9966	0.9907	0.9616	0.8639	0.6637	0.4898	0.5489	0.8204	0.9765	0.9965	0.9989 (86)	
MIT	19.9347	20.0828	20.3064	20.6253	20.8721	20.9810	20.9975	20.9952	20.9319	20.6180	20.2292	19.9186 (87)	
Th 2	19.9392	19.9422	19.9452	19.9590	19.9617	19.9738	19.9738	19.9761	19.9691	19.9617	19.9564	19.9509 (88)	
util rest of house	0.9980	0.9951	0.9864	0.9435	0.8082	0.5673	0.3773	0.4301	0.7342	0.9618	0.9946	0.9985 (89)	
MIT 2	18.7092	18.9007	19.1869	19.5909	19.8639	19.9651	19.9733	19.9748	19.9295	19.5910	19.0991	18.6975 (90)	
Living area fraction	18.9462	19.1294	19.4034	19.7910	20.0589	20.1616	20.1714	20.1722	fLA = Living area / (4) =				0.1934 (91)
MIT	18.9462	19.1294	19.4034	19.7910	20.0589	20.1616	20.1714	20.1722	20.1234	19.7896	19.3177	18.9337 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9462	19.1294	19.4034	19.7910	20.0589	20.1616	20.1714	20.1722	20.1234	19.7896	19.3177	18.9337 (93)	

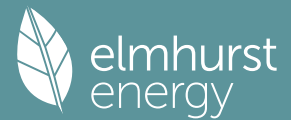
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9935	0.9833	0.9398	0.8141	0.5857	0.3992	0.4533	0.7487	0.9585	0.9930	0.9978 (94)
Useful gains	671.8365	760.1077	819.2571	870.9783	805.5426	576.8735	375.5430	394.9472	599.8078	685.5220	658.1907	645.4550 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1601.2379	1550.7132	1401.8104	1165.7439	892.2088	585.8725	376.2182	396.3995	637.7613	980.8781	1311.4972	1590.9114 (97)
Space heating kWh	691.4747	531.2869	433.4196	212.2312	64.4796	0.0000	0.0000	0.0000	0.0000	219.7449	470.3807	703.4196 (98a)
Space heating requirement - total per year (kWh/year)												3326.4372
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	691.4747	531.2869	433.4196	212.2312	64.4796	0.0000	0.0000	0.0000	0.0000	219.7449	470.3807	703.4196 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3326.4372
Space heating per m2										(98c) / (4) =		35.7835 (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	691.4747	531.2869	433.4196	212.2312	64.4796	0.0000	0.0000	0.0000	0.0000	219.7449	470.3807	703.4196 (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)	749.1600	575.6087	469.5771	229.9363	69.8588	0.0000	0.0000	0.0000	0.0000	238.0769	509.6215	762.1014 (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	243.1341	214.9653	228.4029	201.0788	195.0581	175.9321	173.8323	180.6888	182.6053	203.4048	215.9944	240.5294 (64)
Efficiency of water heater (217)m	86.2689	86.0058	85.4732	84.1810	81.8612	79.8000	79.8000	79.8000	79.8000	84.2334	85.7564	79.8000 (216)
Fuel for water heating, kWh/month	281.8328	249.9427	267.2217	238.8648	238.2790	220.4664	217.8349	226.4271	228.8287	241.4775	251.8697	278.6506 (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	26.6624	21.3896	19.2589	14.1099	10.8989	8.9045	9.9424	12.9235	16.7863	22.0245	24.8766	27.4035 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-42.8266	-60.0387	-85.8129	-95.9082	-102.9140	-95.8503	-94.6347	-89.5695	-80.5787	-68.3540	-46.9505	-37.0634 (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)	-25.2293	-52.9563	-105.0521	-157.5021	-208.0067	-208.9345	-206.5040	-174.9844	-128.4225	-75.6725	-33.6624	-19.9620 (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												3603.9406 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	79.8000	
Water heating fuel used	2941.6958	(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)	215.1810	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2297.3904	(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	4549.4270	(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	3603.9406	0.2100	756.8275 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2941.6958	0.2100	617.7561 (264)
Space and water heating			1374.5837 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	215.1810	0.1443	31.0573 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-900.5017	0.1347	-121.3117
PV Unit electricity exported	-1396.8888	0.1259	-175.9311
Total			-297.2429 (269)
Total CO2, kg/year			1120.3273 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0500 (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	3603.9406	1.1300	4072.4529 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2941.6958	1.1300	3324.1163 (278)
Space and water heating			7396.5692 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	215.1810	1.5338	330.0518 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-900.5017	1.4979	-1348.8559
PV Unit electricity exported	-1396.8888	0.4623	-645.7910
Total			-1994.6469 (283)
Total Primary energy kWh/year			5862.0749 (286)
Target Primary Energy Rate (TPER)			63.0600 (287)



Appendix B – BRUKL Reports for SEN School Buildings

Project name

Classroom NE Block**As designed****Date:** Mon Jan 26 07:52:08 2026

Administrative information

Building Details

Address: Classroom NE Block, Land at Pound Farm, Ickleford, SG5 3RS

Certifier details

Name: Andrew Jones**Telephone number:** 01932 781641**Address:** 51 Staines Rd, Sunbury-on-Thames, TW16 7AH

Certification tool

Calculation engine: TAS**Calculation engine version:** "v9.5.7"**Interface to calculation engine:** TAS**Interface to calculation engine version:** v9.5.7**BRUKL compliance module version:** v6.1.e.1**Foundation area [m²]:** 93.28The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.89
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.21
Target primary energy rate (TPER), kWh _{PE} /m ² annum	52.8
Building primary energy rate (BPER), kWh _{PE} /m ² annum	45.79
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.1	0.1	External Wall
Floors	0.18	0.11	0.15	Exposed Floor
Pitched roofs	0.16	0.1	0.1	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.2	1.2	00 Win 01.1
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	-	-	No personnel doors in project
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF Htg Clg (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	1.2	0.7
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
NE Block Classroom 01	-	-	-	1.2	-	-	-	-	-	-	-	N/A
NE Block Small Group Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A
NE Block Classroom 02	-	-	-	1.2	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
NE Block Classroom 01		110	-	-
NE Block Store 01		110	-	-
NE Block Store 02		110	-	-
NE Block Small Group Room		110	-	-
NE Block Classroom 02		110	-	-
NE Block Store 03		110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
NE Block Classroom 01	NO (-42%)	NO
NE Block Small Group Room	NO (-12%)	NO
NE Block Classroom 02	NO (-40%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	99	99
External area [m ²]	436	436
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	82	118
Average U-value [W/m ² K]	0.19	0.27
Alpha value* [%]	30.25	15.25

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries

100

Non-residential Institutions: Education

Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.04	4.18
Cooling	3.66	3.12
Auxiliary	5.55	8.33
Lighting	5.43	5.68
Hot water	14.32	14.32
Equipment*	13.11	13.11
TOTAL **	30.99	35.63

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	100.19	93.78
Primary energy [kWh _{PE} /m ²]	45.79	52.8
Total emissions [kg/m ²]	4.21	4.89

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	----	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	27.2	73.4	1.9	4.1	6.2	4	5	4	5
	Notional	44.3	55	4.7	3.5	9.3	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Classroom NW Block**As designed****Date:** Mon Jan 26 07:59:30 2026

Administrative information

Building Details

Address: Classroom NW Block, Land at Pound Farm, Ickleford, SG5 3RS

Certifier details

Name: Andrew Jones**Telephone number:** 01932 781641**Address:** 51 Staines Rd, Sunbury-on-Thames, TW16 7AH

Certification tool

Calculation engine: TAS**Calculation engine version:** "v9.5.7"**Interface to calculation engine:** TAS**Interface to calculation engine version:** v9.5.7**BRUKL compliance module version:** v6.1.e.1**Foundation area [m²]:** 94.22The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.88
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.21
Target primary energy rate (TPER), kWh _{PE} /m ² annum	52.75
Building primary energy rate (BPER), kWh _{PE} /m ² annum	45.75
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.1	0.1	External Wall
Floors	0.18	0.11	0.15	Exposed Floor
Pitched roofs	0.16	0.1	0.1	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.2	1.2	00 Win 01.1
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	-	-	No personnel doors in project
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF Htg Clg (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	1.2	0.7
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
NW Block Classroom 01	-	-	-	1.2	-	-	-	-	-	-	-	N/A
NW Block Small Group Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A
NW Block Classroom 02	-	-	-	1.2	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
NW Block Classroom 01		110	-	-
NW Block Store 01		110	-	-
NW Block Store 02		110	-	-
NW Block Small Group Room		110	-	-
NW Block Classroom 02		110	-	-
NW Block Store 03		110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
NW Block Classroom 01	NO (-38%)	NO
NW Block Small Group Room	NO (-5%)	NO
NW Block Classroom 02	NO (-44%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	100	100
External area [m ²]	440	440
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	82	118
Average U-value [W/m ² K]	0.19	0.27
Alpha value* [%]	30.16	15.16

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries

100

Non-residential Institutions: Education

Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.05	4.16
Cooling	3.66	3.15
Auxiliary	5.56	8.34
Lighting	5.42	5.68
Hot water	14.27	14.27
Equipment*	13.12	13.12
TOTAL **	30.97	35.59

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	100.55	94.14
Primary energy [kWh _{PE} /m ²]	45.75	52.75
Total emissions [kg/m ²]	4.21	4.88

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	----	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	27.5	73.3	1.9	4.1	6.2	4	5	4	5
	Notional	44	55.5	4.6	3.5	9.3	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Classroom SE Block**As designed****Date:** Mon Jan 26 09:33:57 2026**Administrative information****Building Details****Address:** Classroom SE Block, Land at Pound Farm,
Ickleford, SG5 3RS**Certifier details****Name:** Andrew Jones**Telephone number:** 01932 781641**Address:** 51 Staines Rd, Sunbury-on-Thames, TW16 7AH**Certification tool****Calculation engine:** TAS**Calculation engine version:** "v9.5.7"**Interface to calculation engine:** TAS**Interface to calculation engine version:** v9.5.7**BRUKL compliance module version:** v6.1.e.1**Foundation area [m²]:** 93.16**The CO₂ emission and primary energy rates of the building must not exceed the targets**

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.91
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.26
Target primary energy rate (TPER), kWh _{PE} /m ² annum	53.09
Building primary energy rate (BPER), kWh _{PE} /m ² annum	46.3
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.1	0.1	External Wall
Floors	0.18	0.11	0.15	Exposed Floor
Pitched roofs	0.16	0.1	0.1	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.2	1.2	00 Win 01.1
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	-	-	No personnel doors in project
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF Htg Clg (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	1.2	0.7
Standard value	0.5	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
SE Block Classroom 01	-	-	-	1.2	-	-	-	-	-	-	-	N/A
SE Block Small Group Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A
SE Block Classroom 02	-	-	-	1.2	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
SE Block Classroom 01	110	-	-
SE Block Store 01	110	-	-
SE Block Store 02	110	-	-
SE Block Small Group Room	110	-	-
SE Block Classroom 02	110	-	-
SE Block Store 03	110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
SE Block Classroom 01	NO (-42%)	NO
SE Block Small Group Room	YES (+1%)	NO
SE Block Classroom 02	NO (-38%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	99	99
External area [m ²]	439	439
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	82	118
Average U-value [W/m ² K]	0.19	0.27
Alpha value* [%]	30.17	15.17

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries

100

Non-residential Institutions: Education

Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.22	4.23
Cooling	3.79	3.24
Auxiliary	5.55	8.33
Lighting	5.43	5.68
Hot water	14.35	14.35
Equipment*	13.1	13.1
TOTAL **	31.34	35.83

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	105.48	96.3
Primary energy [kWh _{PE} /m ²]	46.3	53.09
Total emissions [kg/m ²]	4.26	4.91

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	----	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	30	76	2.1	4.2	6.2	4	5	4	5
	Notional	44.9	57.1	4.7	3.6	9.3	2.64	4.4	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type

Project name

Main Hall**As designed****Date:** Mon Jan 26 11:32:05 2026

Administrative information

Building Details

Address: Main Hall, Land at Pound Farm, Ickleford, SG5 3RS

Certifier details

Name: Andrew Jones**Telephone number:** 01932 781641**Address:** 51 Staines Rd, Sunbury-on-Thames, TW16 7AH

Certification tool

Calculation engine: TAS**Calculation engine version:** "v9.5.7"**Interface to calculation engine:** TAS**Interface to calculation engine version:** v9.5.7**BRUKL compliance module version:** v6.1.e.1**Foundation area [m²]:** 166.43The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	2.73
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	2.25
Target primary energy rate (TPER), kWh _{PE} /m ² annum	27.87
Building primary energy rate (BPER), kWh _{PE} /m ² annum	22.96
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.1	0.1	External Wall
Floors	0.18	0.11	0.15	Exposed Floor
Pitched roofs	0.16	0.1	0.1	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.2	1.2	00 Win 01.1
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	-	-	No personnel doors in project
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF Htg Clg (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	1.2	0.7
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- Nat Vent Elec Htg

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- Extract Elec Htg (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	0.3	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
Multi Purpose Hall	-	-	-	1.2	-	-	-	-	-		-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Catering Kitchen	-	-	-	1.2	-	-	-	-	-	-	N/A
Staff Change	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 01	0.3	-	-	-	-	-	-	-	-	-	N/A
Life Skills Kitchen	-	-	-	1.2	-	-	-	-	-	-	N/A
WC 02	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 03	0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
Multi Purpose Hall		110	-	-
Catering Kitchen		110	-	-
Dry Store		110	-	-
Staff Change		110	-	-
WC 01		110	-	-
Life Skills Kitchen		110	-	-
WC 02		110	-	-
WC 03		110	-	-
Secure Lobby		110	-	-
Furniture Store		110	-	-
Game Store		110	-	-
Drama Store		110	-	-
PE Store		110	-	-
Store		110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Multi Purpose Hall	NO (-19%)	NO
Catering Kitchen	NO (-32%)	NO
Life Skills Kitchen	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	190	190
External area [m ²]	813	813
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	4
Average conductance [W/K]	134	219
Average U-value [W/m ² K]	0.17	0.27
Alpha value* [%]	28.19	13.19

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries

100

Non-residential Institutions: Education

Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.67	8.37
Cooling	1.8	1.9
Auxiliary	1.95	2.79
Lighting	4.9	5.06
Hot water	10.46	10.46
Equipment*	24.76	24.76
TOTAL **	23.78	28.59

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	8.57	10.14
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>8.57</i>	<i>10.14</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	76.25	101.38
Primary energy [kWh _{PE} /m ²]	22.96	27.87
Total emissions [kg/m ²]	2.25	2.73

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	----	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	39.2	45.3	2.7	2.5	1.6	4	5	4	5
	Notional	73.4	42.2	7.7	2.7	2.4	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	85	0	23.6	0	0	1	0	1	0
	Notional	111.1	0	23	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	73.8	0	20.5	0	9.5	1	0	1	0
	Notional	119.6	0	24.8	0	12.7	1.34	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Specialist Classroom

As designed

Date: Mon Jan 26 11:39:28 2026

Administrative information

Building Details

Address: Specialist Classroom, Land at Pound Farm,
Ickleford, SG5 3RS

Certifier details

Name: Andrew Jones

Telephone number: 01932 781641

Address: 51 Staines Rd, Sunbury-on-Thames, TW16 7AH

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 109.62

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.6
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.02
Target primary energy rate (TPER), kWh _{PE} /m ² annum	49.61
Building primary energy rate (BPER), kWh _{PE} /m ² annum	43.6
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.1	0.1	External Wall
Floors	0.18	0.11	0.15	Exposed Floor
Pitched roofs	0.16	0.1	0.1	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.2	1.2	00 Win 01.1
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	-	-	No personnel doors in project
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF Htg Clg (7 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	1.2	0.7
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
Specialist Classroom	-	-	-	1.2	-	-	-	-	-	-	-	N/A
Small Group Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A
Therapy Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A
Sensory Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A
Hygiene Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A
Counselling Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A
Medical Treatment Room	-	-	-	1.2	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
Specialist Classroom		110	-	-
Spec Store 01		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
Spec Store 02		110	-	-
Small Group Room		110	-	-
Therapy Room		110	-	-
Sensory Room		110	-	-
Hygiene Room		110	-	-
Counselling Room		110	-	-
Spec Store 03		110	-	-
Medical Treatment Room		110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Specialist Classroom	NO (-41%)	NO
Small Group Room	NO (-34%)	NO
Therapy Room	NO (-25%)	NO
Sensory Room	NO (-45%)	NO
Hygiene Room	NO (-45%)	NO
Counselling Room	NO (-25%)	NO
Medical Treatment Room	NO (-40%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	121	121
External area [m ²]	525	525
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	92	133
Average U-value [W/m ² K]	0.17	0.25
Alpha value* [%]	30.97	15.97

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries

100

Non-residential Institutions: Education

Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.38	4.23
Cooling	2.93	2.68
Auxiliary	4.16	6.24
Lighting	5.84	6.13
Hot water	14.16	14.16
Equipment*	15.59	15.59
TOTAL **	29.46	33.45

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	91.51	87.12
Primary energy [kWh _{PE} /m ²]	43.6	49.61
Total emissions [kg/m ²]	4.02	4.6

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	----	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	35.4	61.3	2.5	3.4	4.8	4	5	4	5
	Notional	46.8	49.5	4.9	3.1	7.3	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Sports Pavilion**As designed****Date:** Mon Jan 26 12:36:52 2026**Administrative information****Building Details****Address:** Sports Pavilion, Land at Pound Farm, Ickleford, SG5 3RS**Certifier details****Name:** Andrew Jones**Telephone number:** 01932 781641**Address:** 51 Staines Rd, Sunbury-on-Thames, TW16 7AH**Certification tool****Calculation engine:** TAS**Calculation engine version:** "v9.5.7"**Interface to calculation engine:** TAS**Interface to calculation engine version:** v9.5.7**BRUKL compliance module version:** v6.1.e.1**Foundation area [m²]:** 158.12**The CO₂ emission and primary energy rates of the building must not exceed the targets**

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.54
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.21
Target primary energy rate (TPER), kWh _{PE} /m ² annum	49.12
Building primary energy rate (BPER), kWh _{PE} /m ² annum	45.63
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.1	0.1	External Wall
Floors	0.18	0.1	0.1	Ground Floor
Pitched roofs	0.16	0.1	0.1	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.2	1.2	00 Win 01.1
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	-	-	No personnel doors in project
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF Htg Clg (10 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	1.2	0.7
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- Nat Vent Elec Htg

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- Extract Elec Htg (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	0.3	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
Pav Showers 01	-	-	-	1.2	-	-	-	-	-		-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Pav Acc Shower 01	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav WC 01	0.3	-	-	-	-	-	-	-	-	-	N/A
Pav WC 02	0.3	-	-	-	-	-	-	-	-	-	N/A
Pav Changing 01	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav Circ 01	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav WC 03	0.3	-	-	-	-	-	-	-	-	-	N/A
Pav Hygiene/Baby Change	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav Shower 02	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav Acc WC	0.3	-	-	-	-	-	-	-	-	-	N/A
Pav Single Change	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav Changing 02	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav Shower 03	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav Acc Shower 02	-	-	-	1.2	-	-	-	-	-	-	N/A
Pav WC 04	0.3	-	-	-	-	-	-	-	-	-	N/A
Pav WC 05	0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
Pav Showers 01		110	-	-
Pav Acc Shower 01		110	-	-
Pav WC 01		110	-	-
Pav WC 02		110	-	-
Pav Changing 01		110	-	-
Pav Secure Lobby		110	-	-
Pav Circ 01		110	-	-
Pav WC 03		110	-	-
Pav Hygiene/Baby Change		110	-	-
Pav Shower 02		110	-	-
Pav Store 01		110	-	-
Pav Acc WC		110	-	-
Pav Single Change		110	-	-
Pav Changing 02		110	-	-
Pav Shower 03		110	-	-
Pav Acc Shower 02		110	-	-
Pav WC 04		110	-	-
Pav WC 05		110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Pav Showers 01	N/A	N/A
Pav Acc Shower 01	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Pav Changing 01	NO (-80%)	NO
Pav Circ 01	N/A	N/A
Pav Hygiene/Baby Change	N/A	N/A
Pav Shower 02	N/A	N/A
Pav Single Change	N/A	N/A
Pav Changing 02	NO (-81%)	NO
Pav Shower 03	N/A	N/A
Pav Acc Shower 02	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	161	161
External area [m ²]	604	604
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	78	141
Average U-value [W/m ² K]	0.13	0.23
Alpha value* [%]	31.96	16.96

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries

100

Non-residential Institutions: Education

Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6.75	10.05
Cooling	2.3	4.53
Auxiliary	5.56	3.82
Lighting	6.14	5.69
Hot water	10.09	10.09
Equipment*	34.01	34.01
TOTAL **	30.85	34.18

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0.99
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0.99</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	137.52	170.39
Primary energy [kWh _{PE} /m ²]	45.63	49.12
Total emissions [kg/m ²]	4.21	4.54

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	----	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	101.8	52.2	7.1	2.9	5.9	4	5	4	5
	Notional	106.6	90.3	11.2	5.7	3.4	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	35.2	0	9.8	0	0	1	0	1	0
	Notional	67.7	0	14	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	9.7	0	2.7	0	9.5	1	0	1	0
	Notional	22.4	0	4.6	0	12.7	1.34	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Staff Block

As designed

Date: Mon Jan 26 15:24:22 2026

Administrative information

Building Details

Address: Staff Block, Land at Pound Farm, Ickleford, SG5 3RS

Certifier details

Name: Andrew Jones

Telephone number: 01932 781641

Address: 51 Staines Rd, Sunbury-on-Thames, TW16 7AH

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 98.91The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	3.46
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	2.64
Target primary energy rate (TPER), kWh _{PE} /m ² annum	36.28
Building primary energy rate (BPER), kWh _{PE} /m ² annum	26.73
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.1	0.1	External Wall
Floors	0.18	0.1	0.1	Ground Floor
Pitched roofs	0.16	0.1	0.1	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.2	1.2	00 Win 01.1
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	-	-	No personnel doors in project
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF Htg Clg (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	1.2	0.7
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- Nat Vent Elec Htg

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- Extract Elec Htg (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	0.3	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
Staff PPA / Staff Room	-	-	-	1.2	-	-	-	-	-		-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Staff WC 01	0.3	-	-	-	-	-	-	-	-	-	N/A
Staff Senior Leadership Team	-	-	-	1.2	-	-	-	-	-	-	N/A
Staff Sick Room	0.3	-	-	-	-	-	-	-	-	-	N/A
Staff Parents Room	-	-	-	1.2	-	-	-	-	-	-	N/A
Staff Interview Room	-	-	-	1.2	-	-	-	-	-	-	N/A
Staff WC 02	0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
Staff PPA / Staff Room		110	-	-
Staff Store 01		110	-	-
Staff Store 02		110	-	-
Staff Store 03		110	-	-
Staff WC 01		110	-	-
Staff Senior Leadership Team		110	-	-
Staff Sick Room		110	-	-
Staff Secure Lobby 01		110	-	-
Staff Waiting Area		110	-	-
Staff Secure Lobby 02		110	-	-
Staff Store 04		110	-	-
Staff Parents Room		110	-	-
Staff Interview Room		110	-	-
Staff WC 02		110	-	-
Staff Maintenance Store		110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Staff PPA / Staff Room	NO (-48%)	NO
Staff Senior Leadership Team	NO (-43%)	NO
Staff Sick Room	NO (-31%)	NO
Staff Parents Room	NO (-61%)	NO
Staff Interview Room	NO (-28%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	124	124
External area [m ²]	506	506
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	86	119
Average U-value [W/m ² K]	0.17	0.24
Alpha value* [%]	32.55	17.55

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries

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Non-residential Institutions: Education

Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.24	6.72
Cooling	1.28	1.01
Auxiliary	2.08	1.58
Lighting	6.04	5.81
Hot water	15.61	15.61
Equipment*	17.48	17.48
TOTAL **	30.24	30.72

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	12.54	6.47
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>12.54</i>	<i>6.47</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	70.06	69.41
Primary energy [kWh _{PE} /m ²]	26.73	36.28
Total emissions [kg/m ²]	2.64	3.46

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	----	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	63	44.6	4.4	2.5	3	4	5	4	5
	Notional	69.3	30.9	7.3	2	1.7	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	36.1	0	10	0	0	1	0	1	0
	Notional	48.5	0	10.1	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	63.7	0	17.7	0	7.8	1	0	1	0
	Notional	86.2	0	17.9	0	10.4	1.34	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type



Appendix C – North Herts Bronze, Silver, Gold Checklist



Sustainability Checklist

North Hertfordshire Sustainability Supplementary Planning Document 2024 sets three standards of sustainability being bronze, silver and gold with bronze being baseline which represents current policy and Building Regulations compliance.

Applicants are not expected to achieve the high standards (Gold) across all themes rather the expectation is for applicants to select individual themes on which to excel depending on site context, type and scale of development.

The 8 themes have been condensed into the following:

- Optimising Passive Design & Fabric Performance
- Achieving Low Carbon Energy
- Minimising Carbon Footprint
- Healthy Placemaking
- Promoting Biodiversity
- Sustainable Travel
- Conserving Water
- Incorporating Sustainable Drainage



Theme	Achievable Requirements	Design Measures
1. Optimising Passive Design & Fabric Performance		
Major Residential Applications of 100 or more dwellings	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
Non-Residential Development	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). Silver: Submit a Sustainability Statement showing: • Maximisation of solar gain through site layout, orientation, and design (for the purpose of energy efficiency) • Measures to prevent overheating Silver: Submit an Energy Statement from a certified assessor showing: • Low carbon alternatives to gas boilers • On-site reductions of 35% CO2 emissions over and above Building Regulations Part L (including 10% through fabric first measures, inclusive of MVHR) unless justifiably difficult to achieve.	Energy and Sustainability Statements will be submitted by an industry certified energy assessor with experience within domestic and non domestic projects.
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
Non-Residential Development	Bronze: Ensure development is Policy & Building Regulations compliant	Building Regulations compliance will be achieved within all relevant areas of low carbon energy
4. Healthy Placemaking		



Theme	Achievable Requirements	Design Measures
Residential and Non-Residential	Bronze: Ensure compliance with Policy requirements and open space standards	
	Silver: All schemes must submit a landscaping strategy	Landscaping Report to be submitted by Landscape Architect
	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.	
	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
5. Promoting Biodiversity 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).	
	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.	
	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.	



Theme	Achievable Requirements	Design Measures
	Silver: Ensure that an assessment of additional features within the site but beyond compensation for species affected is included in the species assessment.	
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.	
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.	
	Bronze: Submit a plan showing the habitat proposals achieve at least 10% BNG.	
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.	
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
EV Charging	Bronze: Ensure compliance with Policy and the Building Regs Part S	EV chargers to be installed where appropriate or facilitate future connection
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.
Non-Residential Development	Bronze: Applicants are encouraged to achieve a minimum of 1 credit for category Wat 01 of BREEAM.	Wat 01 spreadsheet to be completed at design stage and checked at as built stage
8. Incorporating Sustainable Drainage	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.	Civil engineer carried out SuDS strategy for planning
	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.	



Theme	Achievable Requirements	Design Measures
	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.	