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EXCELLENCE IN ENERGY ASSESSMENT	Date	April 2024
	Ref	265
	Client	Oakes Drafting Services
Description	Construction of a new dwelling	
Location	Da Lowr, Bridge Road, Illogan, Redruth TR16 4SA	

Climate Emergency Development Plan Document

Planning Policy SEC1

Energy Statement for a new dwelling

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This document is to be read in conjunction with associated drawings and information as submitted with a Planning Permission application

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Planning Policy SEC1 Energy Statement for a new dwelling

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1 EXECUTIVE SUMMARY

This energy statement has been prepared to support a Full Planning application for the construction of a New Dwelling.

This energy statement is used to demonstrate how the property has been designed to prioritise a low energy and sustainable living environment through the inclusion of;

- ✓ highly insulated external elements
- ✓ energy efficient space heating
- ✓ the use of low and zero carbon energy systems

which will have a positive impact on the local environment and meet the technical requirements of Cornwall Council Planning Policy SEC1

Note: figures used in this statement derive from calculations produced by SAP 10 modelling software.

2 INTRODUCTION

EAC South West is an established 'On-Construction SAP / EPC' energy assessment and building regulation compliance consultancy has been instructed to provide this report to assist relevant parties in understanding the design concept for the buildings energy consumption and performance.

A SAP calculation can only be prepared by an accredited OCDEA SAP Assessor. EAC South West holds this qualification and has used Elmhurst Energy Assessment software in the preparation of this energy statement.

The Energy Strategy for this development has taken into account Lean, Clean and Green factors to minimise energy demand, by adopting;

- ✓ Be Lean: use less energy and optimise the most suitable passive measures
- ✓ Be Clean: use of the most suitable energy efficient heating system
- ✓ Be Green: measures for carbon emission savings

To show compliance with Policy SEC1, the report is based on results obtained with use of the Governments Standard Assessment Procedure (SAP) which is used for calculating the energy performance of dwellings and CO₂ emissions.

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3 PLANNING POLICY

Energy statements are a mandatory requirement for applications relating to a new build home (not for homes formed by a change of use).

Cornwall Council Climate Emergency Development Plan Document Planning Policy SEC1 Sustainable Energy and Construction Part 2b focuses on the energy use of new build homes in a drive towards net zero operational energy demand through three elements of policy.

1. Space heating energy threshold: 30kWh/m²/year
2. Total energy threshold: 40kWh/m²/year
3. Renewable Energy Requirement +> than the total energy demand

The council's Planning Policy SEC1: Energy Summary Tool – sap v2 is used to summarise results.

4 THE DESIGN

A SAP 10 calculation has been used to model the dwelling and the data produced has been used to show compliance with Planning Policy SEC1, and the Building Regulations Part L.

The design: includes measures that will minimise energy consumption, reduce CO₂ emissions below that of the Building Regulation Target Emission Rate (TER) and also incorporate low and zero carbon energy generation to ensure that the property meets the energy efficiency demands of Planning Policy SEC1 and the technical requirements of the Building Regulations Part L.

Construction elements: the proposed development has included improved insulation standards, exceeding the Building Regulation: Part L requirements to retain heat and maximise thermal comfort in living spaces and ensure a good quality of life for occupants.

Element	Measure	Proposed	Part L
Ground Floor	W/m ² K	0.11	0.18
External Wall	W/m ² K	0.18	0.18
Roof	W/m ² K	0.11	0.15
Openings	W/m ² K	1.0	1.40



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Solar Gains: the design and orientation enables the property to benefit from solar gains, which make a significant contribution towards energy efficiency and reducing energy requirements during winter months.

Building Regulations Part O: an overheating assessment of the dwelling has been completed and confirms that the design complies with Part O guidance for glazing, openings and natural ventilation requirements.

Energy Efficient Measures

Lighting: low energy lighting (LED) shall be fitted throughout the property.

Heating and Hot Water: the property will use a ground source heat pump to collect low temperature heat from the air, and to then concentrate that heat to a usable temperature for space heating and hot water.

Although the heat pump will use electricity to run the pumps, the energy coefficient of performance is generally 3 'or more', meaning that for every 1kWh of electricity used, 3kWh 'or more' of heat is generated.

Element	Measure	Proposed	Part L
Space Heating Emitter	Part L 2022	Proposed flow temp 35c	Max flow temp 55c
Heating Controls	Part L 2022	Time and temperature zone control	Time and temperature zone control
Mechanical ventilation with heat recovery	Part L 2022: SFP 'Specific Fan Power'	SFP 0.5 and heat recovery 81%	SFP 1.5 and heat recovery 73%

The heating system will be run in tandem with a Mechanical Ventilation and Heat Recovery System to ensure that heat retention is maximised, and that energy input will be minimal.



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5 LOW AND ZERO CARBON ENERGY SYSTEMS

The design has significantly reduced energy use and carbon emissions through enhanced fabric and energy efficient measures, and it is proposed to make the property more efficient with the inclusion of a ground source heat pump to serve heating and hotwater requirements.

Renewable Energy Systems: an assessment of the options available to reduce CO₂ emissions, and it is proposed for a heat pump to be installed that will serve the heating and hot water demand of the property.

Air Source Heat Pump: the low carbon green energy heating system will provide enough power for the space heating and hot water demands of the dwelling

Solar Photovoltaics (PV): the proposals include a PV installation.

The PV system has the additional benefit for any surplus energy generated to be available for export to the national grid, and therefore further reducing the development carbon footprint.

Ventilation: the need to provide additional ventilation through an mechanical ventilation with heat recovery (MVHR) will be installed to provide a constant supply of fresh filtered air, whilst heat is recovered and circulated back into the property.

Building Regulations Part G 17k. Water Efficiency: the potential consumption of wholesome water by persons occupying a dwelling should not exceed 125 litres per person per day.

A water efficiency calculation has been carried out in accordance with the methodology set out in Part G and confirms that the design complies with water efficiency requirements.



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6 RESULTS

Planning Policy SEC1: Energy Summary Tool – output summary

Note: figures used in this statement derive from calculations produced by SAP 10 modelling software.

3 - INPUT SAP (10.2) DATA



SAP Conversion Tool V2.0

Climate Zone: 4 South West England

Results			
Space heat demand	Total energy use	Renewable generation	Renewable deficit
kWh/m ² _{TFA} .yr	kWh/m ² _{GIA} .yr	% total energy	kWh/year
Required values:			
<30	<40	100%	0
<i>EXAMPLE</i> 30.0	33.4	107%	0
26.5	22.7	102%	0

Planning Policy SEC1	Space Heating Demand kWh/m ² /yr	Total Energy Use kWh/m ² /yr	Renewable Energy Generation % total energy
Proposed Dwelling	26.5	22.7	102%
Compliance	Max 30	Max 40	= 23.15
	PASS	PASS	PASS



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Building Regulations Compliance – Part L 2021

Building Regulations Part L 2021	Dwelling Emission Rate kgCO ₂ /m ²
Dwelling Target Emission Rate	8.40
Dwelling 'As-Designed' Emission Rate	0.18
Part L PASS	+ 98%
Building Regulations Part L 2021	Fabric Energy Efficiency kWh/m ² /yr
Dwelling Target Fabric Energy Efficiency	37.19
Dwelling 'As-Designed' Fabric Energy Efficiency	35.60
PART L PASS	+ 4%
Building Regulations Part L 2021	Dwelling Primary Energy Rate kWh/m ² /yr
Dwelling Target Primary Energy Rate	43.98
Dwelling 'As-Designed' Primary Energy Rate	2.18
PART L PASS	+ 95%
SAP RATING	100 A

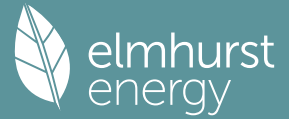
7 CONCLUSION

- There appears to be no technical problems with the design proposals
- The development accords with the guidance set out in the Cornwall Council Planning Policy SEC1 Sustainable Energy and Construction Part 2b
- The design is compliant with relevant building Regulation requirements
 - Part G 17k. water efficiency
 - Part L. conservation of fuel and power
 - Part O. overheating
- The design acknowledges the constraints and opportunities provided by the site and location
- No offsetting payment is necessary with this scheme

8 APPENDICES

- ✓ As-Design SAP Calculation

Full SAP Calculation Printout



Property Reference	265		Issued on Date	23/04/2024	
Assessment Reference	00001	Prop Type Ref	New Dwelling		
Property	Da Lowr, Bridge Rd, Illogan, Cornwall, TR16 4SA				
SAP Rating	100 A	DER	0.18	TER	8.40
Environmental	100 A	% DER < TER			97.86
CO ₂ Emissions (t/year)	-0.08	DFEE	35.60	TFEE	37.19
Compliance Check	See BREL	% DFEE < TFEE			4.27
% DPER < TPER	95.05	DPER	2.18	TPER	43.98
Assessor Details	Mr. Jeremy Downing			Assessor ID	M928-0001
Client	265.				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	82.0000 (1b)	x 2.3500 (2b)	= 192.7000 (1b) - (3b)
First floor	81.3700 (1c)	x 2.6000 (2c)	= 211.5620 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	404.2620 (5)

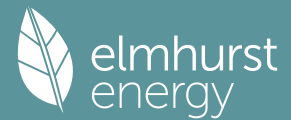
2. Ventilation rate

	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	2.5000	(17)
Infiltration rate	0.1250	(18)
Number of sides sheltered	4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0875 (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	0.1116 0.1094 0.1072 0.0963 0.0941 0.0831 0.0831 0.0809 0.0875 0.0941 0.0984 0.1028	(22b)
Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)
Effective ac	0.2066 0.2044 0.2022 0.1912 0.1891 0.1781 0.1781 0.1759 0.1825 0.1891 0.1934 0.1978	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.00)			15.3700	0.9615	14.7788		(27)
Fully Glazed Door (Uw = 1.00)			7.3200	0.9615	7.0385		(27)
Solid Door			1.8300	1.4000	2.5620		(26)
FT 1			82.0000	0.1100	9.0200	110.0000	9020.0000 (28a)
WT 1	178.6900	24.5200	154.1700	0.1800	27.7506	110.0000	16958.7000 (29a)
RT 1	81.3700		81.3700	0.1100	8.9507	9.0000	732.3300 (30)
Total net area of external elements Aum(A, m ²)			342.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.1006		(33)
Internal Wall 1			130.1200			9.0000	1171.0800 (32c)
Internal Floor 1			81.3700			18.0000	1464.6600 (32d)
Internal Ceiling 1			81.3700			9.0000	732.3300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	30079.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							184.1164 (35)

Full SAP Calculation Printout



List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	17.5600	0.3510	6.1636
E3 Sill	12.2400	0.0050	0.0612
E4 Jamb	43.0600	0.0100	0.4306
E5 Ground floor (normal)	36.1000	0.1410	5.0901
E6 Corner (normal)	19.8000	0.0510	1.0098
E6 Intermediate floor within a dwelling	36.1000	-0.0050	-0.1805
E10 Eaves (insulation at ceiling level)	36.1000	0.1200	4.3320
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.9068 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	87.0074 (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	27.5568	27.2649	26.9731	25.5140	25.2222	23.7630	23.7630	23.4712	24.3467	25.2222	25.8058	26.3895 (38)
Average = Sum(39)m / 12 =	114.5641	114.2723	113.9805	112.5214	112.2295	110.7704	110.7704	110.4786	111.3540	112.2295	112.8132	113.3968 (39)
HLP	0.7013	0.6995	0.6977	0.6888	0.6870	0.6780	0.6780	0.6762	0.6816	0.6870	0.6905	0.6941 (40)
HLP (average)												0.6883
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9536 (42)
Hot water usage for mixer showers	73.7418	72.6336	71.0187	67.9290	65.6489	63.1061	61.6607	63.2634	65.0202	67.7503	70.9065	73.4593 (42a)
Hot water usage for baths	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.7270 (42b)
Hot water usage for other uses	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777 (42c)
Average daily hot water use (litres/day)												138.3011 (43)
Daily hot water use	150.4541	147.2412	143.3286	137.3794	132.5481	127.3542	125.3583	129.2540	133.3625	138.8153	144.8562	150.0640 (44)
Energy conte	238.2825	209.6695	220.2908	188.0655	178.4353	156.5968	151.6100	160.0434	164.4493	188.3710	206.3741	234.9639 (45)
Energy content (annual)												2297.1522
Distribution loss (46)m = 0.15 x (45)m	35.7424	31.4504	33.0436	28.2098	26.7653	23.4895	22.7415	24.0065	24.6674	28.2557	30.9561	35.2446 (46)
Water storage loss:												145.0000 (47)
Store volume												1.1800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7930 (49)
Temperature factor from Table 2b												0.9357 (55)
Enter (49) or (54) in (55)												
Total storage loss	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076 (56)
If cylinder contains dedicated solar storage	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (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	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (64)
Total per year (kWh/year)												2638.6930 (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	102.4350	90.6754	96.4527	84.9893	82.5358	74.5259	73.6164	76.4205	77.1369	85.8394	91.0769	101.3316 (65)

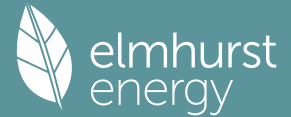
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.4389	200.8788	181.4389	187.4869	181.4389	187.4869	181.4389	181.4389	187.4869	181.4389	187.4869	181.4389 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.7248	338.1982	329.4453	310.8115	287.2897	265.1826	250.4136	246.9402	255.6931	274.3269	297.8486	319.9558 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679 (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)	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435 (71)
Water heating gains (Table 5)	137.6815	134.9337	129.6408	118.0406	110.9352	103.5082	98.9467	102.7157	107.1345	115.3756	126.4957	136.1983 (72)
Total internal gains	721.1490	741.3145	707.8288	683.6429	646.9677	623.4815	598.1031	598.3987	617.6184	638.4452	679.1350	704.8969 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.4200	10.6334	0.6300	0.7000	0.7700	20.8631 (74)
East	2.6800	19.6403	0.6300	0.7000	0.7700	16.0862 (76)
South	1.6600	46.7521	0.6300	0.7000	0.7700	23.7181 (78)
West	4.6100	19.6403	0.6300	0.7000	0.7700	27.6707 (80)
East	7.3200	19.6403	0.6300	0.7000	0.7700	43.9370 (76)

Full SAP Calculation Printout



Solar gains	132.2751	250.2625	399.7451	576.7782	709.8306	729.9330	693.4396	592.1865	461.7219	292.9137	163.1954	110.0024 (83)
Total gains	853.4241	991.5770	1107.5740	1260.4211	1356.7983	1353.4145	1291.5427	1190.5852	1079.3402	931.3588	842.3304	814.8992 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.9312	73.1175	73.3047	74.2553	74.4484	75.4291	75.4291	75.6283	75.0337	74.4484	74.0632	73.6820
alpha	5.8621	5.8745	5.8870	5.9504	5.9632	6.0286	6.0286	6.0419	6.0022	5.9632	5.9375	5.9121
util living area	0.9951	0.9876	0.9666	0.8870	0.7250	0.5187	0.3767	0.4254	0.6825	0.9336	0.9883	0.9962 (86)
Living	20.2095	20.3504	20.5434	20.7785	20.9062	20.9437	20.9479	20.9474	20.9262	20.7409	20.4364	20.1883
Non living	19.3918	19.5723	19.8165	20.1074	20.2484	20.2909	20.2939	20.2953	20.2740	20.0698	19.6892	19.3699
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	20.5956	20.3504	20.5434	20.7785	20.9062	20.9437	20.9479	20.9474	20.9262	20.7409	20.4364	20.3018 (87)
Th 2	20.3397	20.3413	20.3429	20.3508	20.3524	20.3603	20.3603	20.3619	20.3571	20.3524	20.3492	20.3460 (88)
util rest of house	0.9940	0.9849	0.9593	0.8654	0.6850	0.4688	0.3223	0.3671	0.6282	0.9157	0.9852	0.9954 (89)
MIT 2	19.9618	19.5723	19.8165	20.1074	20.2484	20.2909	20.2939	20.2953	20.2740	20.0698	19.6892	19.5458 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.0317	19.6581	19.8966	20.1813	20.3209	20.3629	20.3660	20.3672	20.3459	20.1437	19.7715	19.6291 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0317	19.6581	19.8966	20.1813	20.3209	20.3629	20.3660	20.3672	20.3459	20.1437	19.7715	19.6291 (93)

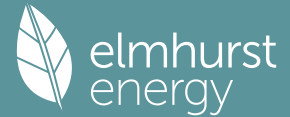
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9934	0.9813	0.9534	0.8591	0.6830	0.4690	0.3228	0.3676	0.6272	0.9089	0.9818	0.9941 (94)
Useful gains	847.7754	973.0517	1055.9807	1082.8781	926.6870	634.7009	416.8482	437.6273	676.9579	846.5109	826.9702	810.1219 (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	1802.2842	1686.4371	1526.9456	1269.3905	967.5178	638.3538	417.1588	438.2888	695.5012	1071.0878	1429.5102	1749.6105 (97)
Space heating kWh	710.1545	479.3950	350.3979	134.2889	30.3781	0.0000	0.0000	0.0000	0.0000	167.0852	433.8288	698.9795 (98a)
Space heating requirement - total per year (kWh/year)												3004.5080
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	710.1545	479.3950	350.3979	134.2889	30.3781	0.0000	0.0000	0.0000	0.0000	167.0852	433.8288	698.9795 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3004.5080
Space heating per m2										(98c) / (4) =		18.3908 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												
Fraction of space heat from main system(s)												
Efficiency of main space heating system 1 (in %)												
Efficiency of main space heating system 2 (in %)												
Efficiency of secondary/supplementary heating system, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	710.1545	479.3950	350.3979	134.2889	30.3781	0.0000	0.0000	0.0000	0.0000	167.0852	433.8288	698.9795 (98)
Space heating efficiency (main heating system 1)	361.0910	361.0910	361.0910	361.0910	361.0910	0.0000	0.0000	0.0000	0.0000	361.0910	361.0910	361.0910 (210)
Space heating fuel (main heating system)	196.6691	132.7629	97.0387	37.1898	8.4129	0.0000	0.0000	0.0000	0.0000	46.2723	120.1439	193.5743 (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	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (64)
Efficiency of water heater (217)m	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919 (216)
Fuel for water heating, kWh/month	150.8478	133.1155	140.6940	121.9793	117.0724	104.2196	101.9333	106.6928	108.6512	122.6798	132.3119	148.9749 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	28.5677	25.8031	28.5677	27.6462	28.5677	27.6462	28.5677	27.6462	28.5677	27.6462	28.5677	28.5677 (231)
Lighting	40.5284	32.5134	29.2747	21.4479	16.5670	13.5353	15.1129	19.6444	25.5161	33.4785	37.8139	41.6548 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-88.9295	-145.6928	-240.7334	-306.2739	-358.5775	-344.0697	-339.4939	-306.3525	-250.8068	-181.7994	-104.6176	-74.5958 (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	-1.2262	-4.7511	-15.4899	-37.1158	-65.6515	-73.0149	-72.0788	-53.2406	-30.8268	-10.5231	-2.3200	-0.8491 (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												832.0639 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.1919

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Water heating fuel used	1489.1725 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6820)	
mechanical ventilation fans (SFP = 0.6820)	336.3622 (230a)
Total electricity for the above, kWh/year	336.3622 (231)
Electricity for lighting (calculated in Appendix L)	327.0871 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3109.0309 (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	-124.3452 (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	832.0639	0.1569	130.5621 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1489.1725	0.1412	210.2819 (264)
Space and water heating			340.8440 (265)
Pumps, fans and electric keep-hot	336.3622	0.1387	46.6576 (267)
Energy for lighting	327.0871	0.1443	47.2088 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2741.9431	0.1321	-362.3312
PV Unit electricity exported	-367.0878	0.1164	-42.7262
Total			-405.0574 (269)
Total CO2, kg/year			29.6529 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.1800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	832.0639	1.5809	1315.3932 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1489.1725	1.5221	2266.7414 (278)
Space and water heating			3582.1346 (279)
Pumps, fans and electric keep-hot	336.3622	1.5128	508.8487 (281)
Energy for lighting	327.0871	1.5338	501.6971 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2741.9431	1.4882	-4080.6860
PV Unit electricity exported	-367.0878	0.4267	-156.6212
Total			-4237.3072 (283)
Total Primary energy kWh/year			355.3731 (286)
Dwelling Primary energy Rate (DPER)			2.1800 (287)

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

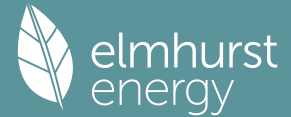
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	82.0000 (1b)	x 2.3500 (2b)	= 192.7000 (1b) - (3b)
First floor	81.3700 (1c)	x 2.6000 (2c)	= 211.5620 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3700		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 404.2620 (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) = 0.0989 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3489 (18)
Number of sides sheltered	4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7000 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.2443 (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													
Effective ac	0.3114	0.3053	0.2992	0.2687	0.2626	0.2320	0.2320	0.2259	0.2443	0.2626	0.2748	0.2870	(22b)
	0.5485	0.5466	0.5448	0.5361	0.5345	0.5269	0.5269	0.5255	0.5298	0.5345	0.5378	0.5412	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8300	1.0000	1.8300			(26)
TER Opening Type (Uw = 1.20)			22.6900	1.1450	25.9809			(27)
FT 1			82.0000	0.1300	10.6600			(28a)
WT 1	178.6900	24.5200	154.1700	0.1800	27.7506			(29a)
RT 1	81.3700		81.3700	0.1100	8.9507			(30)
Total net area of external elements Aum(A, m2)			342.0600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 75.1722			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							184.1164	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	17.5600	0.0500	0.8780	
E3 Sill	12.2400	0.0500	0.6120	
E4 Jamb	43.0600	0.0500	2.1530	
E5 Ground floor (normal)	36.1000	0.1600	5.7760	
E16 Corner (normal)	19.8000	0.0900	1.7820	
E6 Intermediate floor within a dwelling	36.1000	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	36.1000	0.0600	2.1660	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				13.3670 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 88.5392 (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	73.7129	72.9216	72.6754	71.5188	71.3024	70.2950	70.2950	70.1084	70.6830	71.3024	71.7401	72.1978	(38)
Heat transfer coeff	161.7121	161.4608	161.2146	160.0580	159.8416	158.8342	158.8342	158.6476	159.2222	159.8416	160.2794	160.7370	(39)
Average = Sum(39)m / 12 =													160.0569

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9899	0.9883	0.9868	0.9797	0.9784	0.9722	0.9722	0.9711	0.9746	0.9784	0.9811	0.9839	(40)
HLP (average)													0.9797
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

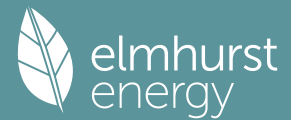
4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy													2.9536 (42)
Hot water usage for mixer showers	73.7418	72.6336	71.0187	67.9290	65.6489	63.1061	61.6607	63.2634	65.0202	67.7503	70.9065	73.4593	(42a)
Hot water usage for baths	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.7270	(42b)
Hot water usage for other uses	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777	(42c)
Average daily hot water use (litres/day)													138.3011 (43)
Daily hot water use	150.4541	147.2412	143.3286	137.3794	132.5481	127.3542	125.3583	129.2540	133.3625	138.8153	144.8562	150.0640	(44)
Energy conte	238.2825	209.6695	220.2908	188.0655	178.4353	156.5968	151.6100	160.0434	164.4493	188.3710	206.3741	234.9639	(45)
Energy content (annual)													Total = Sum(45)m = 2297.1522
Distribution loss (46)m = 0.15 x (45)m	35.7424	31.4504	33.0436	28.2098	26.7653	23.4895	22.7415	24.0065	24.6674	28.2557	30.9561	35.2446	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	284.8774	251.7552	266.8857	233.1574	225.0302	201.6886	198.2049	206.6383	209.5412	234.9659	251.4660	281.5588	(62)
WWHRS	-33.7117	-29.8149	-31.2204	-25.8517	-24.0929	-20.6165	-19.3246	-20.5498	-21.3306	-25.1464	-28.4878	-33.0874	(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	251.1658	221.9404	235.6653	207.3056	200.9373	181.0722	178.8802	186.0885	188.2106	209.8195	222.9782	248.4714	(64)
Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2532.5348 (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	116.5049	103.3837	110.5226	98.6053	96.6056	88.1419	87.6862	90.4904	90.7529	99.9093	104.6929	115.4014	(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	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.4389	200.8788	181.4389	187.4869	181.4389	187.4869	181.4389	181.4389	187.4869	181.4389	187.4869	181.4389	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

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Cooking gains	334.7248	338.1982	329.4453	310.8115	287.2897	265.1826	250.4136	246.9402	255.6931	274.3269	297.8486	319.9558 (68)
(calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679 (69)
Losses e.g. evaporation	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)
(negative values) (Table 5)												
Water heating gains (Table 5)	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435 (71)
Total internal gains	156.5926	153.8448	148.5519	136.9518	129.8463	122.4193	117.8578	121.6268	126.0457	134.2867	145.4068	155.1094 (72)
	743.0601	763.2256	729.7399	705.5540	668.8788	642.3926	617.0142	617.3098	636.5295	660.3563	701.0461	726.8080 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	6.4200	10.6334	0.6300	0.7000	0.7700	20.8631 (74)						
East	10.0000	19.6403	0.6300	0.7000	0.7700	60.0232 (76)						
South	1.6600	46.7521	0.6300	0.7000	0.7700	23.7181 (78)						
West	4.6100	19.6403	0.6300	0.7000	0.7700	27.6707 (80)						
Solar gains	132.2751	250.2625	399.7451	576.7782	709.8306	729.9330	693.4396	592.1865	461.7219	292.9137	163.1954	110.0024 (83)
Total gains	875.3352	1013.4881	1129.4851	1282.3322	1378.7094	1372.3256	1310.4538	1209.4963	1098.2513	953.2699	864.2415	836.8103 (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	51.6678	51.7482	51.8272	52.2017	52.2724	52.6039	52.6039	52.6658	52.4757	52.2724	52.1296	51.9812
alpha	4.4445	4.4499	4.4551	4.4801	4.4848	4.5069	4.5069	4.5111	4.4984	4.4848	4.4753	4.4654
util living area	0.9955	0.9907	0.9794	0.9405	0.8471	0.6793	0.5182	0.5773	0.8183	0.9630	0.9911	0.9963 (86)
MIT	19.4259	19.6266	19.9395	20.3697	20.7250	20.9272	20.9829	20.9727	20.8273	20.3577	19.8174	19.3914 (87)
Th 2	20.0918	20.0931	20.0943	20.1003	20.1014	20.1065	20.1065	20.1075	20.1045	20.1014	20.0991	20.0968 (88)
util rest of house	0.9943	0.9884	0.9740	0.9245	0.8068	0.6042	0.4198	0.4765	0.7573	0.9500	0.9885	0.9954 (89)
MIT 2	18.2330	18.4899	18.8882	19.4282	19.8460	20.0561	20.0990	20.0943	19.9667	19.4225	18.7390	18.1923 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.3644	18.6151	19.0041	19.5319	19.9429	20.1521	20.1963	20.1911	20.0615	19.5255	18.8578	18.3244 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3644	18.6151	19.0041	19.5319	19.9429	20.1521	20.1963	20.1911	20.0615	19.5255	18.8578	18.3244 (93)

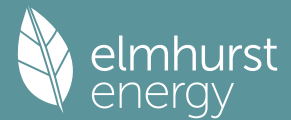
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9911	0.9830	0.9652	0.9120	0.7987	0.6083	0.4300	0.4863	0.7539	0.9389	0.9832	0.9926 (94)
Useful gains	867.5646	996.2789	1090.2156	1169.4280	1101.1139	834.7906	563.5068	588.2244	828.0171	895.0361	849.7510	830.6554 (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	2274.3874	2214.4535	2015.8367	1701.7227	1317.5536	881.8631	571.2230	601.4426	949.2089	1426.6724	1884.5313	2270.3156 (97)
Space heating kWh	1046.6761	818.6133	688.6621	383.2522	161.0311	0.0000	0.0000	0.0000	0.0000	395.5374	745.0418	1071.1072 (98a)
Space heating requirement - total per year (kWh/year)	5309.9213											
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	1046.6761	818.6133	688.6621	383.2522	161.0311	0.0000	0.0000	0.0000	0.0000	395.5374	745.0418	1071.1072 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5309.9213											
Space heating per m ²	(98c) / (4) = 32.5024 (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	1046.6761	818.6133	688.6621	383.2522	161.0311	0.0000	0.0000	0.0000	0.0000	395.5374	745.0418	1071.1072 (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)	1133.9936	886.9050	746.1128	415.2245	174.4649	0.0000	0.0000	0.0000	0.0000	428.5346	807.1958	1160.4628 (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	251.1658	221.9404	235.6653	207.3056	200.9373	181.0722	178.8802	186.0885	188.2106	209.8195	222.9782	248.4714 (64)
Efficiency of water heater (217)m	86.9032	86.7141	86.3180	85.4183	83.5680	79.8000	79.8000	79.8000	79.8000	85.4593	86.5515	79.8000 (216)
Fuel for water heating, kWh/month	289.0177	255.9450	273.0200	242.6947	240.4477	226.9075	224.1607	233.1936	235.8528	245.5197	257.6248	285.7523 (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	37.6994	30.2439	27.2313	19.9508	15.4106	12.5906	14.0580	18.2732	23.7350	31.1416	35.1744	38.7472 (232)

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Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-70.5444	-96.4373	-134.3935	-146.2491	-153.5893	-141.7491	-139.8342	-133.9059	-123.0028	-107.7959	-76.4090	-61.3357	(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	-49.5197	-102.9084	-202.3305	-300.8173	-394.9370	-395.9521	-391.4347	-332.8202	-245.7171	-146.2956	-65.8082	-39.2685	(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												5752.8941	(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												3010.1366	(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)												304.2560	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4053.0554	(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												5100.2313	(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	5752.8941	0.2100	1208.1078	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3010.1366	0.2100	632.1287	(264)
Space and water heating			1840.2365	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	304.2560	0.1443	43.9135	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1385.2462	0.1353	-187.4093	
PV Unit electricity exported	-2667.8092	0.1262	-336.6486	
Total			-524.0579	(269)
Total CO2, kg/year			1372.0214	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.4000	(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	5752.8941	1.1300	6500.7704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3010.1366	1.1300	3401.4544	(278)
Space and water heating			9902.2247	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	304.2560	1.5338	466.6780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1385.2462	1.5000	-2077.9337	
PV Unit electricity exported	-2667.8092	0.4632	-1235.7649	
Total			-3313.6986	(283)
Total Primary energy kWh/year			7185.3049	(286)
Target Primary Energy Rate (TPER)			43.9800	(287)

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

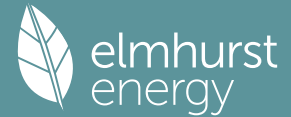
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	82.0000 (1b)	x 2.3500 (2b)	= 192.7000 (1b) - (3b)	
First floor	81.3700 (1c)	x 2.6000 (2c)	= 211.5620 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3700		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 404.2620 (5)	

2. Ventilation rate

m³ per hour

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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) =	0.0989 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.5000 (17)
Infiltration rate			0.2239 (18)
Number of sides sheltered			4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1568 (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	0.1999	0.1960	0.1920	0.1724	0.1685	0.1489	0.1489	0.1450	0.1568	0.1685	0.1764	0.1842 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5200	0.5192	0.5184	0.5149	0.5142	0.5111	0.5111	0.5105	0.5123	0.5142	0.5156	0.5170 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 1.00)			15.3700	0.9615	14.7788		(27)
Fully Glazed Door (Uw = 1.00)			7.3200	0.9615	7.0385		(27)
Solid Door			1.8300	1.4000	2.5620		(26)
FT 1			82.0000	0.1100	9.0200	110.0000	9020.0000 (28a)
WT 1	178.6900	24.5200	154.1700	0.1800	27.7506	110.0000	16958.7000 (29a)
RT 1	81.3700		81.3700	0.1100	8.9507	9.0000	732.3300 (30)
Total net area of external elements Aum(A, m2)			342.0600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	70.1006	(33)
Internal Wall 1			130.1200			9.0000	1171.0800 (32c)
Internal Floor 1			81.3700			18.0000	1464.6600 (32d)
Internal Ceiling 1			81.3700			9.0000	732.3300 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							30079.1000 (34)
List of Thermal Bridges							184.1164 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.5600	0.3510	6.1636
E3 Sill	12.2400	0.0050	0.0612
E4 Jamb	43.0600	0.0100	0.4306
E5 Ground floor (normal)	36.1000	0.1410	5.0901
E16 Corner (normal)	19.8000	0.0510	1.0098
E6 Intermediate floor within a dwelling	36.1000	-0.0050	-0.1805
E10 Eaves (insulation at ceiling level)	36.1000	0.1200	4.3320

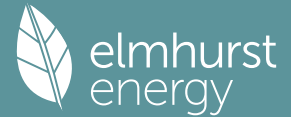
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.9068 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		87.0074 (37)

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	69.3679	69.2645	69.1630	68.6866	68.5975	68.1826	68.1826	68.1058	68.3424	68.5975	68.7778	68.9663 (38)
Average = Sum(39)m / 12 =	156.3753	156.2718	156.1704	155.6940	155.6049	155.1900	155.1900	155.1131	155.3498	155.6049	155.7852	155.9737 (39)
												155.6936
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9572	0.9566	0.9559	0.9530	0.9525	0.9499	0.9499	0.9495	0.9509	0.9525	0.9536	0.9547 (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													2.9536 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.7270	31.7270 (42b)
Hot water usage for other uses	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777	44.8777 (42c)
Average daily hot water use (litres/day)													70.3136 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	76.7123	74.6076	72.3099	69.4504	66.8993	64.2481	63.6976	65.9906	68.3424	71.0649	73.9497	76.6047 (44)	
Energy content (annual)	121.4935	106.2402	111.1376	95.0741	90.0593	79.0005	77.0367	81.7101	84.2730	96.4344	105.3549	119.9444 (45)	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Total heat required for water heating calculated for each month													
WWHRS	103.2695	90.3042	94.4670	80.8130	76.5504	67.1505	65.4812	69.4536	71.6320	81.9693	89.5517	101.9528 (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)	
													0.0000 (63c)

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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	103.2695	90.3042	94.4670	80.8130	76.5504	67.1505	65.4812	69.4536	71.6320	81.9693	89.5517	101.9528	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											992.5950 (64)	
Electric shower(s)	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											993 (64)	
59.0549	52.6184	57.4573	54.8308	55.8597	53.2847	55.0608	55.8597	54.8308	57.4573	56.3769	59.0549	671.7460	(64a)
Heat gains from water heating, kWh/month	40.5811	35.7306	37.9811	33.9109	33.1025	30.1088	30.1355	31.3283	31.6157	34.8566	36.4821	40.2519	(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	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.4389	200.8788	181.4389	187.4869	181.4389	187.4869	181.4389	181.4389	187.4869	181.4389	187.4869	181.4389	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.7248	338.1982	329.4453	310.8115	287.2897	265.1826	250.4136	246.9402	255.6931	274.3269	297.8486	319.9558	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	(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)	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	(71)
Water heating gains (Table 5)	54.5445	53.1706	51.0498	47.0985	44.4926	41.8178	40.5047	42.1080	43.9107	46.8503	50.6696	54.1020	(72)
Total internal gains	638.0120	659.5514	629.2379	612.7008	580.5251	561.7911	539.6611	537.7909	554.3945	569.9199	603.3090	622.8006	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	6.4200	10.6334	0.6300	0.7000	0.7700	20.8631 (74)							
East	2.6800	19.6403	0.6300	0.7000	0.7700	16.0862 (76)							
South	1.6600	46.7521	0.6300	0.7000	0.7700	23.7181 (78)							
West	4.6100	19.6403	0.6300	0.7000	0.7700	27.6707 (80)							
East	7.3200	19.6403	0.6300	0.7000	0.7700	43.9370 (76)							
Solar gains	132.2751	250.2625	399.7451	576.7782	709.8306	729.9330	693.4396	592.1865	461.7219	292.9137	163.1954	110.0024	(83)
Total gains	770.2871	909.8139	1028.9830	1189.4790	1290.3557	1291.7241	1233.1007	1129.9774	1016.1164	862.8336	766.5044	732.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.4311	53.4665	53.5012	53.6649	53.6957	53.8392	53.8392	53.8659	53.7838	53.6957	53.6335	53.5687	
alpha	4.5621	4.5644	4.5667	4.5777	4.5797	4.5893	4.5893	4.5911	4.5856	4.5797	4.5756	4.5712	
util living area	0.9973	0.9938	0.9849	0.9513	0.8644	0.6998	0.5367	0.6009	0.8422	0.9730	0.9944	0.9979	(86)
MIT	19.4013	19.6019	19.9147	20.3469	20.7120	20.9224	20.9818	20.9700	20.8122	20.3238	19.7819	19.3606	(87)
Th 2	20.1192	20.1197	20.1202	20.1227	20.1231	20.1253	20.1253	20.1257	20.1244	20.1231	20.1222	20.1212	(88)
util rest of house	0.9966	0.9923	0.9809	0.9378	0.8271	0.6259	0.4377	0.4996	0.7856	0.9631	0.9927	0.9973	(89)
MIT 2	18.6395	18.8397	19.1505	19.5742	19.9118	20.0828	20.1189	20.1141	20.0049	19.5580	19.0217	18.6004	(90)
Living area fraction	FLA = Living area / (4) =											0.1102 (91)	
MIT	18.7234	18.9237	19.2347	19.6593	20.0000	20.1753	20.2139	20.2084	20.0939	19.6424	19.1055	18.6842	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7234	18.9237	19.2347	19.6593	20.0000	20.1753	20.2139	20.2084	20.0939	19.6424	19.1055	18.6842	(93)

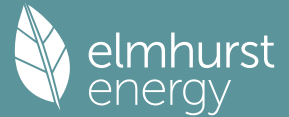
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9951	0.9893	0.9756	0.9290	0.8211	0.6305	0.4481	0.5097	0.7834	0.9559	0.9900	0.9961	(94)
Ext temp.	766.5052	900.1174	1003.8457	1105.0334	1059.5723	814.4054	552.5184	575.9893	795.9914	824.8074	758.8136	729.9165	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	2255.4701	2191.5025	1988.7857	1675.1582	1291.5146	865.2276	560.8451	590.7335	931.1482	1407.0378	1870.2763	2259.1499	(97)
Space heating requirement - total per year (kWh/year)	1107.7898	867.8108	732.7954	410.4899	172.5651	0.0000	0.0000	0.0000	0.0000	433.1795	800.2532	1137.7497	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating contribution - total per year (kWh/year)	1107.7898	867.8108	732.7954	410.4899	172.5651	0.0000	0.0000	0.0000	0.0000	433.1795	800.2532	1137.7497	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5662.6332	
Space heating per m2												(98c) / (4) = 34.6614 (99)	

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1458.7857	1148.4057	1178.8598	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8103	0.8821	0.8412	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1182.0042	1013.0214	991.6806	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1421.4032	1356.6708	1239.8854	0.0000	0.0000	0.0000	0.0000	(103)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	172.3673	255.6751	184.6644	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.0918	63.9188	46.1661	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												153.1767 (107)
Energy for space heating												34.6614 (99)
Energy for space cooling												0.9376 (108)
Total												35.5990 (109)
Fabric Energy Efficiency (DFEE)												35.6 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	82.0000 (1b)	x 2.3500 (2b)	= 192.7000 (1b) - (3b)
First floor	81.3700 (1c)	x 2.6000 (2c)	= 211.5620 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 404.2620 (5)

2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	4 * 10 =											40.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	40.0000 / (5) =											0.0989 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												5.0000 (17)
Infiltration rate												0.3489 (18)
Number of sides sheltered												4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.2443 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3114	0.3053	0.2992	0.2687	0.2626	0.2320	0.2320	0.2259	0.2443	0.2626	0.2748	0.2870 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5485	0.5466	0.5448	0.5361	0.5345	0.5269	0.5269	0.5255	0.5298	0.5345	0.5378	0.5412 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			1.8300	1.0000	1.8300		(26)					
TER Opening Type (Uw = 1.20)			22.6900	1.1450	25.9809		(27)					
FT 1			82.0000	0.1300	10.6600		(28a)					
WT 1	178.6900	24.5200	154.1700	0.1800	27.7506		(29a)					
RT 1	81.3700		81.3700	0.1100	8.9507		(30)					
Total net area of external elements Aum(A, m ²)			342.0600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		75.1722		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								184.1164 (35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E2 Other lintels (including other steel lintels)				17.5600	0.0500	0.8780						
E3 Sill				12.2400	0.0500	0.6120						
E4 Jamb				43.0600	0.0500	2.1530						
E5 Ground floor (normal)				36.1000	0.1600	5.7760						
E16 Corner (normal)				19.8000	0.0900	1.7820						
E6 Intermediate floor within a dwelling				36.1000	0.0000	0.0000						
E10 Eaves (insulation at ceiling level)				36.1000	0.0600	2.1660						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								13.3670 (36)				
Point Thermal bridges								(36a) = 0.0000				
Total fabric heat loss								(33) + (36) + (36a) = 88.5392 (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	73.1729	72.9216	72.6754	71.5188	71.3024	70.2950	70.2950	70.1084	70.6830	71.3024	71.7401	72.1978 (38)
Heat transfer coeff	161.7121	161.4608	161.2146	160.0580	159.8416	158.8342	158.8342	158.6476	159.2222	159.8416	160.2794	160.7370 (39)
Average = Sum(39)m / 12 =												160.0569

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9899	0.9883	0.9868	0.9797	0.9784	0.9722	0.9722	0.9711	0.9746	0.9784	0.9811	0.9839 (40)
HLP (average)												0.9797
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9536 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.7270 (42b)
Hot water usage for other uses	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777 (42c)
Average daily hot water use (litres/day)												70.3136 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.7123	74.6076	72.3099	69.4504	66.8993	64.2481	63.6976	65.9906	68.3424	71.0649	73.9497	76.6047 (44)
Energy content (annual)	121.4935	106.2402	111.1376	95.0741	90.0593	79.0005	77.0367	81.7101	84.2730	96.4344	105.3549	119.9444 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	103.2695	90.3042	94.4670	80.8130	76.5504	67.1505	65.4812	69.4536	71.6320	81.9693	89.5517	101.9528 (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	103.2695	90.3042	94.4670	80.8130	76.5504	67.1505	65.4812	69.4536	71.6320	81.9693	89.5517	101.9528 (64)
12Total per year (kWh/year)												992.5950 (64)
Electric shower(s)	59.0549	52.6184	57.4573	54.8308	55.8597	53.2847	55.0608	55.8597	54.8308	57.4573	56.3769	59.0549 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												671.7460 (64a)
Heat gains from water heating, kWh/month	40.5811	35.7306	37.9811	33.9109	33.1025	30.1088	30.1355	31.3283	31.6157	34.8566	36.4821	40.2519 (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	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794	147.6794 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.4389	200.8788	181.4389	187.4869	181.4389	187.4869	181.4389	181.4389	187.4869	181.4389	187.4869	181.4389 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.7248	338.1982	329.4453	310.8115	287.2897	265.1826	250.4136	246.9402	255.6931	274.3269	297.8486	319.9558 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679	37.7679 (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)	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435 (71)
Water heating gains (Table 5)	54.5445	53.1706	51.0498	47.0985	44.4926	41.8178	40.5047	42.1080	43.9107	46.8503	50.6696	54.1020 (72)
Total internal gains	638.0120	659.5514	629.2379	612.7008	580.5251	561.7911	539.6611	537.7909	554.3945	569.9199	603.3090	622.8006 (73)

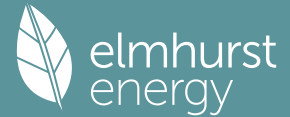
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	6.4200	10.6334	0.6300	0.7000	0.7700	20.8631 (74)						
East	10.0000	19.6403	0.6300	0.7000	0.7700	60.0232 (76)						
South	1.6600	46.7521	0.6300	0.7000	0.7700	23.7181 (78)						
West	4.6100	19.6403	0.6300	0.7000	0.7700	27.6707 (80)						
Solar gains	132.2751	250.2625	399.7451	576.7782	709.8306	729.9330	693.4396	592.1865	461.7219	292.9137	163.1954	110.0024 (83)
Total gains	770.2871	909.8139	1028.9830	1189.4790	1290.3557	1291.7241	1233.1007	1129.9774	1016.1164	862.8336	766.5044	732.8029 (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	51.6678	51.7482	51.8272	52.2017	52.2724	52.6039	52.6039	52.6658	52.4757	52.2724	52.1296	51.9812
alpha	4.4445	4.4499	4.4551	4.4801	4.4848	4.5069	4.5069	4.5111	4.4984	4.4848	4.4753	4.4654
util living area	0.9973	0.9939	0.9854	0.9533	0.8704	0.7092	0.5469	0.6109	0.8485	0.9739	0.9944	0.9978 (86)
MIT	19.3371	19.5406	19.8601	20.3075	20.6864	20.9132	20.9788	20.9658	20.7958	20.2906	19.7361	19.3030 (87)
Th 2	20.0918	20.0931	20.0943	20.1003	20.1014	20.1065	20.1065	20.1075	20.1045	20.1014	20.0991	20.0968 (88)
util rest of house	0.9966	0.9923	0.9814	0.9401	0.8336	0.6344	0.4447	0.5070	0.7924	0.9642	0.9928	0.9973 (89)
MIT 2	18.5548	18.7585	19.0767	19.5185	19.8708	20.0589	20.0991	20.0943	19.9742	19.5087	18.9586	18.5246 (90)
Living area fraction												0.1102 (91)
MIT	18.6410	18.8447	19.1630	19.6054	19.9606	20.1530	20.1960	20.1903	20.0647	19.5949	19.0443	18.6104 (92)

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Temperature adjustment													0.0000
adjusted MIT	18.6410	18.8447	19.1630	19.6054	19.9606	20.1530	20.1960	20.1903	20.0647	19.5949	19.0443		18.6104 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9950	0.9894	0.9760	0.9311	0.8270	0.6386	0.4553	0.5172	0.7894	0.9569	0.9900	0.9960	(94)
Useful gains	766.4416	900.1284	1004.2788	1107.4931	1067.0719	824.9031	561.4773	584.4621	802.1678	825.6346	758.8087	729.8600	(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	2319.1146	2251.5255	2041.4578	1713.4856	1320.3936	882.0068	571.1721	601.3279	949.7151	1437.7575	1914.4257	2316.2778	(97)
Space heating kWh	1155.1887	908.1389	771.6612	436.3146	188.4713	0.0000	0.0000	0.0000	0.0000	455.4195	832.0442	1180.2949	(98a)
Space heating requirement - total per year (kWh/year)												5927.5333	
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	1155.1887	908.1389	771.6612	436.3146	188.4713	0.0000	0.0000	0.0000	0.0000	455.4195	832.0442	1180.2949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5927.5333	
Space heating per m2											(98c) / (4) =	36.2829	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1493.0414	1175.3730	1205.7221	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7977	0.8718	0.8298	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1191.0450	1024.7067	1000.4979	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1421.4032	1356.6708	1239.8854	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	165.8579	246.9813	178.1043	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =				1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.4645	61.7453	44.5261	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													147.7359 (107)
Energy for space heating													36.2829 (99)
Energy for space cooling													0.9043 (108)
Total													37.1872 (109)
Fabric Energy Efficiency (TFEE)													37.2 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	82.0000 (1b)	x 2.3500 (2b)	= 192.7000 (1b) - (3b)
First floor	81.3700 (1c)	x 2.6000 (2c)	= 211.5620 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	404.2620 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5000	(17)
Infiltration rate		0.1250	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.0875 (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	0.1116	0.1094	0.1072	0.0963	0.0941	0.0831	0.0831	0.0809	0.0875	0.0941	0.0984	0.1028	(22b)
Balanced mechanical ventilation with heat recovery													

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If mechanical ventilation 0.5000 (23a)
 If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
 If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 81.0000 (23c)

Effective ac 0.2066 0.2044 0.2022 0.1912 0.1891 0.1781 0.1781 0.1759 0.1825 0.1891 0.1934 0.1978 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 1.00)			15.3700	0.9615	14.7788		(27)
Fully Glazed Door (Uw = 1.00)			7.3200	0.9615	7.0385		(27)
Solid Door			1.8300	1.4000	2.5620		(26)
FT 1			82.0000	0.1100	9.0200	110.0000	9020.0000 (28a)
WT 1	178.6900	24.5200	154.1700	0.1800	27.7506	110.0000	16958.7000 (29a)
RT 1	81.3700		81.3700	0.1100	8.9507	9.0000	732.3300 (30)
Total net area of external elements Aum(A, m2)			342.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.1006		(33)
Internal Wall 1			130.1200			9.0000	1171.0800 (32c)
Internal Floor 1			81.3700			18.0000	1464.6600 (32d)
Internal Ceiling 1			81.3700			9.0000	732.3300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	30079.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							184.1164 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.5600	0.3510	6.1636	
E3 Sill				12.2400	0.0050	0.0612	
E4 Jamb				43.0600	0.0100	0.4306	
E5 Ground floor (normal)				36.1000	0.1410	5.0901	
E16 Corner (normal)				19.8000	0.0510	1.0098	
E6 Intermediate floor within a dwelling				36.1000	-0.0050	-0.1805	
E10 Eaves (insulation at ceiling level)				36.1000	0.1200	4.3320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.9068 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	87.0074 (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	27.5568	27.2649	26.9731	25.5140	25.2222	23.7630	23.7630	23.4712	24.3467	25.2222	25.8058	26.3895 (38)
Average = Sum(39)m / 12 =	114.5641	114.2723	113.9805	112.5214	112.2295	110.7704	110.7704	110.4786	111.3540	112.2295	112.8132	113.3968 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7013	0.6995	0.6977	0.6888	0.6870	0.6780	0.6780	0.6762	0.6816	0.6870	0.6905	0.6941 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

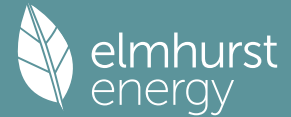
4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	73.7418	72.6336	71.0187	67.9290	65.6489	63.1061	61.6607	63.2634	65.0202	67.7503	70.9065	73.4593 (42a)
Hot water usage for baths	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.7270 (42b)
Hot water usage for other uses	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777 (42c)
Average daily hot water use (litres/day)												138.3011 (43)
Daily hot water use	150.4541	147.2412	143.3286	137.3794	132.5481	127.3542	125.3583	129.2540	133.3625	138.8153	144.8562	150.0640 (44)
Energy conte	238.2825	209.6695	220.2908	188.0655	178.4353	156.5968	151.6100	160.0434	164.4493	188.3710	206.3741	234.9639 (45)
Energy content (annual)										Total = Sum(45)m =		2297.1522
Distribution loss (46)m = 0.15 x (45)m	35.7424	31.4504	33.0436	28.2098	26.7653	23.4895	22.7415	24.0065	24.6674	28.2557	30.9561	35.2446 (46)
Water storage loss:												145.0000 (47)
Store volume												1.1800 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7930 (49)
Temperature factor from Table 2b												0.9357 (55)
Enter (49) or (54) in (55)												
Total storage loss	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076 (56)
If cylinder contains dedicated solar storage	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (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	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (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	102.4350	90.6754	96.4527	84.9893	82.5358	74.5259	73.6164	76.4205	77.1369	85.8394	91.0769	101.3316 (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	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.5651	39.5823	32.1905	24.3703	18.2171	15.3796	16.6182	21.6010	28.9928	36.8130	42.9663	45.8037 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	499.5892	504.7734	491.7094	463.8978	428.7907	395.7949	373.7517	368.5675	381.6315	409.4431	444.5502	477.5460 (68)
(calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751 (69)
Losses e.g. evaporation	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)
(negative values) (Table 5)												
Water heating gains (Table 5)	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435 (71)
Total internal gains	137.6815	134.9337	129.6408	118.0406	110.9352	103.5082	98.9467	102.7157	107.1345	115.3756	126.4957	136.1983 (72)
	796.5826	794.0362	768.2876	721.0556	672.6898	629.4296	604.0635	607.6311	632.5057	676.3785	728.7590	774.2949 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	6.4200	10.6334	0.6300	0.7000	1.0000	27.0949 (74)						
East	2.6800	19.6403	0.6300	0.7000	1.0000	20.8912 (76)						
South	1.6600	46.7521	0.6300	0.7000	1.0000	30.8028 (78)						
West	4.6100	19.6403	0.6300	0.7000	1.0000	35.9360 (80)						
East	7.3200	19.6403	0.6300	0.7000	1.0000	57.0610 (76)						
Solar gains	171.7859	325.0162	519.1495	749.0626	921.8579	947.9650	900.5709	769.0733	599.6388	380.4074	211.9420	142.8602 (83)
Total gains	968.3685	1119.0525	1287.4371	1470.1183	1594.5478	1577.3946	1504.6344	1376.7045	1232.1445	1056.7859	940.7011	917.1551 (84)

7. Mean internal temperature (heating season)

Utilisation during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.9312	73.1175	73.3047	74.2553	74.4484	75.4291	75.4291	75.6283	75.0337	74.4484	74.0632	73.6820
alpha	5.8621	5.8745	5.8870	5.9504	5.9632	6.0286	6.0286	6.0419	6.0022	5.9632	5.9375	5.9121
util living area	0.9908	0.9782	0.9381	0.8213	0.6355	0.4474	0.3237	0.3686	0.6093	0.8953	0.9802	0.9931 (86)
Living	20.2859	20.4304	20.6386	20.8407	20.9268	20.9463	20.9482	20.9481	20.9360	20.7941	20.4986	20.2570
Non living	19.4890	19.6729	19.9322	20.1758	20.2674	20.2927	20.2941	20.2957	20.2817	20.1301	19.7673	19.4575
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	20.6347	20.4304	20.6386	20.8407	20.9268	20.9463	20.9482	20.9481	20.9360	20.7941	20.4986	20.3609 (87)
Th 2	20.3397	20.3413	20.3429	20.3508	20.3524	20.3603	20.3603	20.3619	20.3571	20.3524	20.3492	20.3460 (88)
util rest of house	0.9888	0.9736	0.9262	0.7941	0.5962	0.4035	0.2767	0.3177	0.5573	0.8710	0.9753	0.9915 (89)
MIT 2	20.0006	19.6729	19.9322	20.1758	20.2674	20.2927	20.2941	20.2957	20.2817	20.1301	19.7673	19.6176 (90)
Living area fraction	FLA = Living area / (4) =											0.1102 (91)
MIT	20.0704	19.7563	20.0100	20.2491	20.3400	20.3648	20.3662	20.3675	20.3538	20.2033	19.8478	19.6995 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0704	19.7563	20.0100	20.2491	20.3400	20.3648	20.3662	20.3675	20.3538	20.2033	19.8478	19.6995 (93)

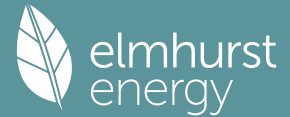
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9878	0.9688	0.9194	0.7896	0.5954	0.4038	0.2772	0.3182	0.5570	0.8647	0.9706	0.9897 (94)
Useful gains	956.5957	1084.0927	1183.6322	1160.7637	949.4621	636.9309	417.0464	438.0318	686.3468	913.7718	913.0764	907.6738 (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	1806.7257	1697.6670	1539.8754	1277.0158	969.6670	638.5638	417.1785	438.3286	696.3885	1077.7743	1438.1251	1757.5949 (97)
Space heating kWh	632.4967	412.3219	265.0450	83.7015	15.0325	0.0000	0.0000	0.0000	0.0000	122.0179	378.0351	632.3413 (98a)
Space heating requirement - total per year (kWh/year)												2540.9919
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	632.4967	412.3219	265.0450	83.7015	15.0325	0.0000	0.0000	0.0000	0.0000	122.0179	378.0351	632.3413 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2540.9919
Space heating per m2												(98c) / (4) = 15.5536 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												361.0910 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												65.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	632.4967	412.3219	265.0450	83.7015	15.0325	0.0000	0.0000	0.0000	0.0000	122.0179	378.0351	632.3413 (98)
Space heating efficiency (main heating system 1)	361.0910	361.0910	361.0910	361.0910	361.0910	0.0000	0.0000	0.0000	0.0000	361.0910	361.0910	361.0910 (210)
Space heating fuel (main heating system)	175.1627	114.1878	73.4012	23.1802	4.1631	0.0000	0.0000	0.0000	0.0000	33.7914	104.6925	175.1196 (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	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (64)
Efficiency of water heater (217)m	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919 (216)
												177.1919 (217)

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Fuel for water heating, kWh/month	150.8478	133.1155	140.6940	121.9793	117.0724	104.2196	101.9333	106.6928	108.6512	122.6798	132.3119	148.9749	(219)		
Space cooling fuel requirement															
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)		
Pumps and Fa	28.5677	25.8031	28.5677	27.6462	28.5677	27.6462	28.5677	28.5677	27.6462	28.5677	27.6462	28.5677	(231)		
Lighting	39.0076	31.2933	28.1762	20.6431	15.9453	13.0274	14.5458	18.9072	24.5586	32.2222	36.3949	40.0917	(232)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(233a)m	-88.8848	-145.5176	-240.0246	-305.0860	-357.8500	-343.9761	-339.3893	-306.2516	-250.7303	-181.4746	-104.5419	-74.5682	(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	-1.2709	-4.9264	-16.1986	-38.3037	-66.3790	-73.1086	-72.1834	-53.3416	-30.9033	-10.8480	-2.3957	-0.8767	(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													703.6984	(211)	
Space heating fuel - main system 2													0.0000	(213)	
Space heating fuel - secondary													0.0000	(215)	
Efficiency of water heater													177.1919		
Water heating fuel used													1489.1725	(219)	
Space cooling fuel													0.0000	(221)	
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6820)															
mechanical ventilation fans (SFP = 0.6820)														336.3622	(230a)
Total electricity for the above, kWh/year														336.3622	(231)
Electricity for lighting (calculated in Appendix L)														314.8135	(232)
Energy saving/generation technologies (Appendices M ,N and Q)															
PV generation														-3109.0309	(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														-264.9843	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	703.6984	16.4900	116.0399	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1489.1725	16.4900	245.5645	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	336.3622	16.4900	55.4661	(249)
Energy for lighting	314.8135	16.4900	51.9127	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2738.2949	16.4900	-451.5448	
PV Unit electricity exported	-370.7360	5.5900	-20.7241	
Total			-472.2690	(252)
Total energy cost			-3.2857	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	-0.0057	(257)
SAP value		100.0920	
SAP rating (Section 12)		100	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	703.6984	0.1575	110.8649	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1489.1725	0.1412	210.2819	(264)
Space and water heating			321.1468	(265)
Pumps, fans and electric keep-hot	336.3622	0.1387	46.6576	(267)
Energy for lighting	314.8135	0.1443	45.4373	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2738.2949	0.1321	-361.8179	
PV Unit electricity exported	-370.7360	0.1167	-43.2684	
Total			-405.0863	(269)
Total CO2, kg/year			8.1555	(272)
CO2 emissions per m2			0.0500	(273)
EI value			99.9476	
EI rating			100	(274)
EI band			A	

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	82.0000 (1b)	x 2.3500 (2b)	= 192.7000 (1b) - (3b)
First floor	81.3700 (1c)	x 2.6000 (2c)	= 211.5620 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 404.2620 (5)

2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												2.5000 (17)	
Infiltration rate												0.1250 (18)	
Number of sides sheltered												4 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.7000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0875 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	6.2000	6.0000	6.0000	5.4000	5.2000	4.6000	4.5000	4.4000	4.8000	5.6000	5.7000	6.0000	(22)
Adj infilt rate	1.5500	1.5000	1.5000	1.3500	1.3000	1.1500	1.1250	1.1000	1.2000	1.4000	1.4250	1.5000	(22a)
Balanced mechanical ventilation with heat recovery	0.1356	0.1312	0.1312	0.1181	0.1137	0.1006	0.0984	0.0963	0.1050	0.1225	0.1247	0.1312	(22b)
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)	
Effective ac	0.2306	0.2262	0.2262	0.2131	0.2087	0.1956	0.1934	0.1912	0.2000	0.2175	0.2197	0.2262	(25)

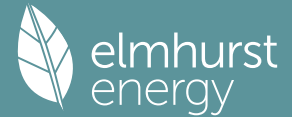
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Window (Uw = 1.00)			15.3700	0.9615	14.7788		(27)						
Fully Glazed Door (Uw = 1.00)			7.3200	0.9615	7.0385		(27)						
Solid Door			1.8300	1.4000	2.5620		(26)						
FT 1			82.0000	0.1100	9.0200	110.0000	9020.0000 (28a)						
WT 1	178.6900	24.5200	154.1700	0.1800	27.7506	110.0000	16958.7000 (29a)						
RT 1	81.3700		81.3700	0.1100	8.9507	9.0000	732.3300 (30)						
Total net area of external elements Aum(A, m2)			342.0600				(31)						
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	70.1006	(33)						
Internal Wall 1			130.1200			9.0000	1171.0800 (32c)						
Internal Floor 1			81.3700			18.0000	1464.6600 (32d)						
Internal Ceiling 1			81.3700			9.0000	732.3300 (32e)						
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							30079.1000 (34)						
List of Thermal Bridges							184.1164 (35)						
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				17.5600	0.3510	6.1636							
E3 Sill				12.2400	0.0050	0.0612							
E4 Jamb				43.0600	0.0100	0.4306							
E5 Ground floor (normal)				36.1000	0.1410	5.0901							
E16 Corner (normal)				19.8000	0.0510	1.0098							
E6 Intermediate floor within a dwelling				36.1000	-0.0050	-0.1805							
E10 Eaves (insulation at ceiling level)				36.1000	0.1200	4.3320							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.9068 (36)						
Point Thermal bridges							(36a) =						
Total fabric heat loss							(33) + (36) + (36a) =						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	30.7669	30.1832	30.1832	28.4323	27.8486	26.0976	25.8058	25.5140	26.6813	29.0159	29.3077	30.1832	(38)
Average = Sum(39)m / 12 =	117.7742	117.1906	117.1906	115.4396	114.8560	113.1050	112.8132	112.5214	113.6887	116.0233	116.3151	117.1906	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7209	0.7173	0.7173	0.7066	0.7030	0.6923	0.6905	0.6888	0.6959	0.7102	0.7120	0.7173	(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	2.9536 (42)
Hot water usage for mixer showers	

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Hot water usage for baths	73.7418	72.6336	71.0187	67.9290	65.6489	63.1061	61.6607	63.2634	65.0202	67.7503	70.9065	73.4593 (42a)
Hot water usage for other uses	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.7270 (42b)
Average daily hot water use (litres/day)	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777 (42c) 138.3011 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	150.4541	147.2412	143.3286	137.3794	132.5481	127.3542	125.3583	129.2540	133.3625	138.8153	144.8562	150.0640 (44)
Distribution loss (46)m = 0.15 x (45)m	238.2825	209.6695	220.2908	188.0655	178.4353	156.5968	151.6100	160.0434	164.4493	188.3710	206.3741	234.9639 (45)
Water storage loss:	35.7424	31.4504	33.0436	28.2098	26.7653	23.4895	22.7415	24.0065	24.6674	28.2557	30.9561	35.2446 (46)
Store volume												145.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1800 (48)
Temperature factor from Table 2b												0.7930 (49)
Enter (49) or (54) in (55)												0.9357 (55)
Total storage loss	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076 (56)
If cylinder contains dedicated solar storage	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (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	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (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	102.4350	90.6754	96.4527	84.9893	82.5358	74.5259	73.6164	76.4205	77.1369	85.8394	91.0769	101.3316 (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	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.5651	39.5823	32.1905	24.3703	18.2171	15.3796	16.6182	21.6010	28.9928	36.8130	42.9663	45.8037 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	499.5892	504.7734	491.7094	463.8978	428.7907	395.7949	373.7517	368.5675	381.6315	409.4431	444.5502	477.5460 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751 (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)	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435 (71)
Water heating gains (Table 5)	137.6815	134.9337	129.6408	118.0406	110.9352	103.5082	98.9467	102.7157	107.1345	115.3756	126.4957	136.1983 (72)
Total internal gains	796.5826	794.0362	768.2876	721.0556	672.6898	629.4296	604.0635	607.6311	632.5057	676.3785	728.7590	774.2949 (73)

6. Solar gains

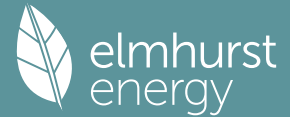
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.4200	14.1491	0.6300	0.7000	1.0000	36.0532 (74)
East	2.6800	26.5119	0.6300	0.7000	1.0000	28.2005 (76)
South	1.6600	58.6702	0.6300	0.7000	1.0000	38.6551 (78)
West	4.6100	26.5119	0.6300	0.7000	1.0000	48.5091 (80)
East	7.3200	26.5119	0.6300	0.7000	1.0000	77.0252 (76)

Solar gains	228.4431	371.8971	590.0166	869.4151	1002.8078	1124.0737	977.7171	898.8283	719.0887	452.1733	271.7784	182.7141 (83)
Total gains	1025.0257	1165.9333	1358.3042	1590.4708	1675.4976	1753.5034	1581.7807	1506.4594	1351.5944	1128.5518	1000.5374	957.0090 (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	70.9434	71.2967	71.2967	72.3781	72.7459	73.8721	74.0632	74.2553	73.4929	72.0140	71.8334	71.2967
util living area	5.7296	5.7531	5.7531	5.8252	5.8497	5.9248	5.9375	5.9504	5.8995	5.8009	5.7889	5.7531
util rest of house	0.9791	0.9599	0.9085	0.7887	0.6374	0.4493	0.3773	0.3802	0.5551	0.8282	0.9508	0.9819 (86)
Living	20.4440	20.5537	20.7058	20.8561	20.9230	20.9449	20.9469	20.9470	20.9394	20.8547	20.6552	20.4460
Non living	19.6752	19.8139	19.9975	20.1768	20.2492	20.2785	20.2817	20.2834	20.2713	20.1777	19.9457	19.6809
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	20.7156	20.5537	20.7058	20.8561	20.9230	20.9449	20.9469	20.9470	20.9394	20.8547	20.6552	20.5235 (87)
Th 2	20.3224	20.3255	20.3255	20.3350	20.3381	20.3476	20.3492	20.3508	20.3445	20.3318	20.3303	20.3255 (88)
util rest of house	0.9743	0.9512	0.8914	0.7591	0.5987	0.4082	0.3313	0.3321	0.5038	0.7917	0.9381	0.9775 (89)
MIT 2	20.0644	19.8139	19.9975	20.1768	20.2492	20.2785	20.2817	20.2834	20.2713	20.1777	19.9457	19.7971 (90)
Living area fraction												fLA = Living area / (4) =
MIT	20.1361	19.8954	20.0755	20.2516	20.3234	20.3519	20.3550	20.3565	20.3449	20.2523	20.0239	19.8771 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1361	19.8954	20.0755	20.2516	20.3234	20.3519	20.3550	20.3565	20.3449	20.2523	20.0239	19.8771 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9727	0.9447	0.8843	0.7552	0.5978	0.4085	0.3317	0.3326	0.5038	0.7870	0.9313	0.9739	(94)
Useful gains	997.0897	1101.4892	1201.1793	1201.1666	1001.6607	716.2830	524.6383	500.9742	680.9338	888.1948	931.7679	932.0305	(95)
Ext temp.	6.3000	6.6000	7.5000	9.0000	11.4000	14.0000	15.7000	15.9000	14.3000	11.8000	9.2000	6.8000	(96)
Heat loss rate W	1629.5381	1558.0996	1473.7325	1298.8857	1024.9109	718.4327	525.1417	501.4551	687.2413	980.6604	1258.9804	1532.5147	(97)
Space heating kWh	470.5416	306.8422	202.7796	70.3578	17.2982	0.0000	0.0000	0.0000	0.0000	68.7944	235.5930	446.7602	(98a)
Space heating requirement - total per year (kWh/year)													1818.9669
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	470.5416	306.8422	202.7796	70.3578	17.2982	0.0000	0.0000	0.0000	0.0000	68.7944	235.5930	446.7602	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													1818.9669
Space heating per m2													(98c) / (4) = 11.1340 (99)

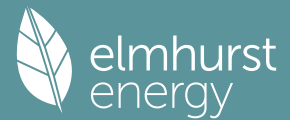
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													362.1708	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													65.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	470.5416	306.8422	202.7796	70.3578	17.2982	0.0000	0.0000	0.0000	0.0000	68.7944	235.5930	446.7602	(98)	
Space heating efficiency (main heating system 1)	362.1708	362.1708	362.1708	362.1708	362.1708	0.0000	0.0000	0.0000	0.0000	362.1708	362.1708	362.1708	(210)	
Space heating fuel (main heating system)	129.9226	84.7231	55.9901	19.4267	4.7762	0.0000	0.0000	0.0000	0.0000	18.9950	65.0503	123.3562	(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	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715	(64)	
Efficiency of water heater (217)m	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	(216)	
Fuel for water heating, kWh/month	150.8263	133.0965	140.6739	121.9619	117.0557	104.2047	101.9188	106.6776	108.6357	122.6622	132.2930	148.9536	(219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	28.5677	25.8031	28.5677	27.6462	28.5677	27.6462	28.5677	28.5677	27.6462	28.5677	27.6462	28.5677	(231)	
Lighting	39.0076	31.2933	28.1762	20.6431	15.9453	13.0274	14.5458	18.9072	24.5586	32.2222	36.3949	40.0917	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-116.2217	-163.4217	-266.1747	-342.0964	-379.3705	-387.3900	-358.5292	-343.0611	-289.1295	-210.0020	-131.3568	-93.9964	(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	-2.5329	-6.8621	-21.6129	-52.0733	-77.7844	-103.0544	-84.3627	-72.8265	-44.6723	-16.0193	-4.4142	-1.6249	(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													502.2401	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													177.2172	
Water heating fuel used													1488.9600	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6820) mechanical ventilation fans (SFP = 0.6820)													336.3622	(230a)
Total electricity for the above, kWh/year													336.3622	(231)
Electricity for lighting (calculated in Appendix L)													314.8135	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3568.5901	(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													-926.2143	(238)

10a. Fuel costs - using BEDF prices (540)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	502.2401	25.1600	126.3636 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1488.9600	25.1600	374.6223 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	336.3622	25.1600	84.6287 (249)
Energy for lighting	314.8135	25.1600	79.2071 (250)
Additional standing charges			0.0000 (251)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3080.7501	25.1600	-775.1167
PV Unit electricity exported	-487.8400	5.8100	-28.3435
Total			-803.4602 (252)
Total energy cost			-138.6385 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	502.2401	0.1577	79.2210 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1488.9600	0.1412	210.2519 (264)
Space and water heating			289.4729 (265)
Pumps, fans and electric keep-hot	336.3622	0.1387	46.6576 (267)
Energy for lighting	314.8135	0.1443	45.4373 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3080.7501	0.1326	-408.5098
PV Unit electricity exported	-487.8400	0.1173	-57.2327
Total			-465.7424 (269)
Total CO2, kg/year			-84.1746 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	502.2401	1.5839	795.4975 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1488.9600	1.5221	2266.4179 (278)
Space and water heating			3061.9154 (279)
Pumps, fans and electric keep-hot	336.3622	1.5128	508.8487 (281)
Energy for lighting	314.8135	1.5338	482.8714 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3080.7501	1.4899	-4590.1277
PV Unit electricity exported	-487.8400	0.4302	-209.8653
Total			-4799.9929 (283)
Total Primary energy kWh/year			-746.3574 (286)

 SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: A 100
 Current environmental impact rating: A 100

N Solar water heating			Recommended
U Solar photovoltaic panels			Already installed
V2 Wind turbine			Recommended
Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 75	-43 kg (51.5%)
V2 Wind turbine	+ 13.2	-£ 692	-496 kg (388.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£75	0.27 kg/m ²	A 101 A 100
Wind turbine	£692	3.04 kg/m ²	A 114 A 103
Total Savings	£767	3.30 kg/m²	

Potential energy efficiency rating: A 114
 Potential environmental impact rating: A 103

Fuel prices for cost data on this page from database revision number 540 TEST (28 Mar 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South West England):

	Current	Potential	Saving
Electricity	£665	£577	£88
Space heating	£211	£231	-£20
Water heating	£375	£267	£108
Lighting	£79	£79	£0
Generated (PV)	-£803	-£791	-£12
Generated (wind)	-£0	-£692	£692
Total cost of fuels	-£138	-£906	£768
Total cost of uses	-£138	-£906	£768
Delivered energy	-6 kWh/m ²	-30 kWh/m ²	24 kWh/m ²
Carbon dioxide emissions	-0.1 tonnes	-0.6 tonnes	0.5 tonnes
CO2 emissions per m ²	-1 kg/m ²	-4 kg/m ²	3 kg/m ²
Primary energy	-5 kWh/m ²	-34 kWh/m ²	29 kWh/m ²

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	82.0000 (1b)	x 2.3500 (2b)	= 192.7000 (1b) - (3b)
First floor	81.3700 (1c)	x 2.6000 (2c)	= 211.5620 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	404.2620 (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		2.5000 (17)
Infiltration rate		0.1250 (18)
Number of sides sheltered		4 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0875 (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	0.1116	0.1094	0.1072	0.0963	0.0941	0.0831	0.0831	0.0809	0.0875	0.0941	0.0984	0.1028 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2066	0.2044	0.2022	0.1912	0.1891	0.1781	0.1781	0.1759	0.1825	0.1891	0.1934	0.1978 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.00)			15.3700	0.9615	14.7788		(27)
Fully Glazed Door (Uw = 1.00)			7.3200	0.9615	7.0385		(27)
Solid Door			1.8300	1.4000	2.5620		(26)
FT 1			82.0000	0.1100	9.0200	110.0000	9020.0000 (28a)
WT 1	178.6900	24.5200	154.1700	0.1800	27.7506	110.0000	16958.7000 (29a)
RT 1	81.3700		81.3700	0.1100	8.9507	9.0000	732.3300 (30)
Total net area of external elements Aum(A, m ²)			342.0600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	70.1006	(33)
Internal Wall 1			130.1200			9.0000	1171.0800 (32c)
Internal Floor 1			81.3700			18.0000	1464.6600 (32d)
Internal Ceiling 1			81.3700			9.0000	732.3300 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	30079.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		184.1164 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.5600	0.3510	6.1636
E3 Sill	12.2400	0.0050	0.0612
E4 Jamb	43.0600	0.0100	0.4306
E5 Ground floor (normal)	36.1000	0.1410	5.0901
E16 Corner (normal)	19.8000	0.0510	1.0098
E6 Intermediate floor within a dwelling	36.1000	-0.0050	-0.1805
E10 Eaves (insulation at ceiling level)	36.1000	0.1200	4.3320

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.9068 (36)
Point Thermal bridges		(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) =	87.0074 (37)

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

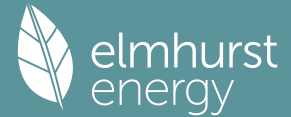
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.5568	27.2649	26.9731	25.5140	25.2222	23.7630	23.7630	23.4712	24.3467	25.2222	25.8058	26.3895 (38)
Heat transfer coeff	114.5641	114.2723	113.9805	112.5214	112.2295	110.7704	110.7704	110.4786	111.3540	112.2295	112.8132	113.3968 (39)
Average = Sum(39)m / 12 =												112.4484

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7013	0.6995	0.6977	0.6888	0.6870	0.6780	0.6780	0.6762	0.6816	0.6870	0.6905	0.6941 (40)
HLP (average)												0.6883
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9536 (42)
Hot water usage for mixer showers												
	73.7418	72.6336	71.0187	67.9290	65.6489	63.1061	61.6607	63.2634	65.0202	67.7503	70.9065	73.4593 (42a)
Hot water usage for baths												

Full SAP Calculation Printout



Hot water usage for other uses	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.2720 (42b)
Average daily hot water use (litres/day)	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777 (42c) 138.3011 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	150.4541	147.2412	143.3286	137.3794	132.5481	127.3542	125.3583	129.2540	133.3625	138.8153	144.8562	150.0640 (44)
Distribution loss (46)m = 0.15 x (45)m	238.2825	209.6695	220.2908	188.0655	178.4353	156.5968	151.6100	160.0434	164.4493	188.3710	206.3741	234.9639 (45)
Water storage loss:	35.7424	31.4504	33.0436	28.2098	26.7653	23.4895	22.7415	24.0065	24.6674	28.2557	30.9561	35.2446 (46)
Store volume												145.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1800 (48)
Temperature factor from Table 2b												0.7930 (49)
Enter (49) or (54) in (55)												0.9357 (55)
Total storage loss	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076 (56)
If cylinder contains dedicated solar storage	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
FV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												623.1136 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												623.1136
Solar input	-0.0000	-16.2123	-58.2396	-80.1684	-105.2696	-96.9167	-96.0953	-83.9546	-57.6132	-28.6440	-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	267.2901	219.6576	191.0588	135.9690	102.1733	87.7519	84.5223	105.0964	134.9080	188.7346	234.4460	263.9715 (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	102.4350	90.6754	96.4527	84.9893	82.5358	74.5259	73.6164	76.4205	77.1369	85.8394	91.0769	101.3316 (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	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.5651	39.5823	32.1905	24.3703	18.2171	15.3796	16.6182	21.6010	28.9928	36.8130	42.9663	45.8037 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	499.5892	504.7734	491.7094	463.8978	428.7907	395.7949	373.7517	368.5675	381.6315	409.4431	444.5502	477.5460 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751 (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)	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435 (71)
Water heating gains (Table 5)	137.6815	134.9337	129.6408	118.0406	110.9352	103.5082	98.9467	102.7157	107.1345	115.3756	126.4957	136.1983 (72)
Total internal gains	796.5826	794.0362	768.2876	721.0556	672.6898	629.4296	604.0635	607.6311	632.5057	676.3785	728.7590	774.2949 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	or Table 6b	Specific data	factor	W						
		W/m2		or Table 6c	Table 6d							
North	6.4200	10.6334	0.6300	0.7000	1.0000	27.0949 (74)						
East	2.6800	19.6403	0.6300	0.7000	1.0000	20.8912 (76)						
South	1.6600	46.7521	0.6300	0.7000	1.0000	30.8028 (78)						
West	4.6100	19.6403	0.6300	0.7000	1.0000	35.9360 (80)						
East	7.3200	19.6403	0.6300	0.7000	1.0000	57.0610 (76)						
Solar gains	171.7859	325.0162	519.1495	749.0626	921.8579	947.9650	900.5709	769.0733	599.6388	380.4074	211.9420	142.8602 (83)
Total gains	968.3685	1119.0525	1287.4371	1470.1183	1594.5478	1577.3946	1504.6344	1376.7045	1232.1445	1056.7859	940.7011	917.1551 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.9312	73.1175	73.3047	74.2553	74.4484	75.4291	75.4291	75.6283	75.0337	74.4484	74.0632	73.6820
alpha	5.8621	5.8745	5.8870	5.9504	5.9632	6.0286	6.0286	6.0419	6.0022	5.9632	5.9375	5.9121
util living area	0.9908	0.9782	0.9381	0.8213	0.6355	0.4474	0.3237	0.3686	0.6093	0.8953	0.9802	0.9931 (86)
Living	20.2859	20.4304	20.6386	20.8407	20.9268	20.9463	20.9482	20.9481	20.9360	20.7941	20.4986	20.2570
Non living	19.4890	19.6729	19.9322	20.1758	20.2674	20.2927	20.2941	20.2957	20.2817	20.1301	19.7673	19.4575
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0

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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	20.6347	20.4304	20.6386	20.8407	20.9268	20.9463	20.9482	20.9481	20.9360	20.7941	20.4986	20.3609 (87)
Th 2	20.3397	20.3413	20.3429	20.3508	20.3524	20.3603	20.3603	20.3619	20.3571	20.3524	20.3492	20.3460 (88)
util rest of house	0.9888	0.9736	0.9262	0.7941	0.5962	0.4035	0.2767	0.3177	0.5573	0.8710	0.9753	0.9915 (89)
MIT 2	20.0006	19.6729	19.9322	20.1758	20.2674	20.2927	20.2941	20.2957	20.2817	20.1301	19.7673	19.6176 (90)
Living area fraction	20.0704	19.7563	20.0100	20.2491	20.3400	20.3648	20.3662	20.3675	20.3538	20.2033	19.8478	0.1102 (91)
MIT	20.0704	19.7563	20.0100	20.2491	20.3400	20.3648	20.3662	20.3675	20.3538	20.2033	19.8478	19.6995 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0704	19.7563	20.0100	20.2491	20.3400	20.3648	20.3662	20.3675	20.3538	20.2033	19.8478	19.6995 (93)

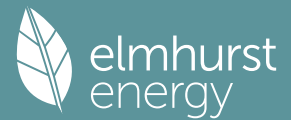
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9878	0.9688	0.9194	0.7896	0.5954	0.4038	0.2772	0.3182	0.5570	0.8647	0.9706	0.9897 (94)
Useful gains	956.5957	1084.0927	1183.6322	1160.7637	949.4621	636.9309	417.0464	438.0318	686.3468	913.7718	913.0764	907.6738 (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	1806.7257	1697.6670	1539.8754	1277.0158	969.6670	638.5638	417.1785	438.3286	696.3885	1077.7743	1438.1251	1757.5949 (97)
Space heating kWh	632.4967	412.3219	265.0450	83.7015	15.0325	0.0000	0.0000	0.0000	0.0000	122.0179	378.0351	632.3413 (98a)
Space heating requirement - total per year (kWh/year)												2540.9919
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	632.4967	412.3219	265.0450	83.7015	15.0325	0.0000	0.0000	0.0000	0.0000	122.0179	378.0351	632.3413 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2540.9919
Space heating per m2										(98c) / (4) =		15.5536 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												361.0910 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												65.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	632.4967	412.3219	265.0450	83.7015	15.0325	0.0000	0.0000	0.0000	0.0000	122.0179	378.0351	632.3413 (98)
Space heating efficiency (main heating system 1)	361.0910	361.0910	361.0910	361.0910	361.0910	0.0000	0.0000	0.0000	0.0000	361.0910	361.0910	361.0910 (210)
Space heating fuel (main heating system)	175.1627	114.1878	73.4012	23.1802	4.1631	0.0000	0.0000	0.0000	0.0000	33.7914	104.6925	175.1196 (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	267.2901	219.6576	191.0588	135.9690	102.1733	87.7519	84.5223	105.0964	134.9080	188.7346	234.4460	263.9715 (64)
Efficiency of water heater (217)m	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919	177.1919 (216)
Fuel for water heating, kWh/month	150.8478	123.9659	107.8259	76.7355	57.6625	49.5237	47.7010	59.3122	76.1367	106.5142	132.3119	148.9749 (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	35.3623	31.9401	35.3623	34.2215	35.3623	34.2215	35.3623	35.3623	34.2215	35.3623	34.2215	35.3623 (231)
Lighting	39.0076	31.2933	28.1762	20.6431	15.9453	13.0274	14.5458	18.9072	24.5586	32.2222	36.3949	40.0917 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-88.8983	-145.4899	-239.2120	-301.6412	-348.9764	-334.0308	-329.5759	-300.1180	-248.5203	-181.2424	-104.5719	-74.5778 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732 (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	-1.2574	-4.9541	-17.0113	-41.7484	-75.2526	-83.0538	-81.9968	-59.4752	-33.1132	-11.0802	-2.3657	-0.8672 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-91.1028	-82.2864	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028 (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												703.6984 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.1919
Water heating fuel used												1137.5122 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6820)												
mechanical ventilation fans (SFP = 0.6820)												336.3622 (230a)
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												416.3622 (231)
Electricity for lighting (calculated in Appendix L)												314.8135 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3109.0309 (233)
Wind generation												-3575.5408 (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												-4112.1854 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	703.6984	16.4900	116.0399 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1137.5122	16.4900	187.5758 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	336.3622	16.4900	55.4661 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	314.8135	16.4900	51.9127 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2696.8550	16.4900	-444.7114
PV Unit electricity exported	-412.1759	5.5900	-23.0406
Total			-467.7520 (252)
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247
Wind Turbine electricity exported	-1072.6622	5.5900	-59.9618
Total			-472.6865 (252)
Total energy cost			-516.2520 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	-0.8919 (257)
SAP value		114.4581
SAP rating (Section 12)		114 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	703.6984	0.1575	110.8649 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1137.5122	0.1454	165.4220 (264)
Space and water heating			276.2869 (265)
Pumps, fans and electric keep-hot	416.3622	0.1387	57.7546 (267)
Energy for lighting	314.8135	0.1443	45.4373 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2696.8550	0.1323	-356.7627
PV Unit electricity exported	-412.1759	0.1162	-47.8806
Total			-404.6432 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	-1072.6622	0.1387	-148.7915
Total			-495.9716 (269)
Total CO2, kg/year			-521.1360 (272)
CO2 emissions per m2			-3.1900 (273)
EI value			103.3514
EI rating			103 (274)
EI band			A

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

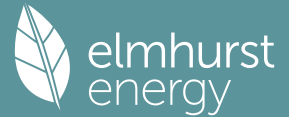
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	82.0000 (1b)	x 2.3500 (2b)	= 192.7000 (1b) - (3b)
First floor	81.3700 (1c)	x 2.6000 (2c)	= 211.5620 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	404.2620 (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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.5000 (17)
Infiltration rate	0.1250 (18)

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Number of sides sheltered												4 (19)													
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.7000 (20)													
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.0875 (21)													
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	6.2000	6.0000	6.0000	5.4000	5.2000	4.6000	4.5000	4.4000	4.8000	5.6000	5.7000	6.0000	(22)
Wind factor	1.5500	1.5000	1.5000	1.3500	1.3000	1.1500	1.1250	1.1000	1.2000	1.4000	1.4250	1.5000	1.5500	1.5000	1.5000	1.3500	1.3000	1.1500	1.1250	1.1000	1.2000	1.4000	1.4250	1.5000	(22a)
Adj infilt rate	0.1356	0.1312	0.1312	0.1181	0.1137	0.1006	0.0984	0.0963	0.1050	0.1225	0.1247	0.1312	0.1356	0.1312	0.1312	0.1181	0.1137	0.1006	0.0984	0.0963	0.1050	0.1225	0.1247	0.1312	(22b)
Balanced mechanical ventilation with heat recovery																									
If mechanical ventilation												0.5000 (23a)													
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)													
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)													
Effective ac	0.2306	0.2262	0.2262	0.2131	0.2087	0.1956	0.1934	0.1912	0.2000	0.2175	0.2197	0.2262	0.2306	0.2262	0.2262	0.2131	0.2087	0.1956	0.1934	0.1912	0.2000	0.2175	0.2197	0.2262	(25)

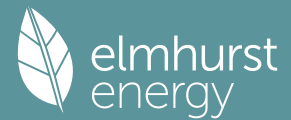
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K																		
Window (Uw = 1.00)			15.3700	0.9615	14.7788			(27)																	
Fully Glazed Door (Uw = 1.00)			7.3200	0.9615	7.0385			(27)																	
Solid Door			1.8300	1.4000	2.5620			(26)																	
FT 1			82.0000	0.1100	9.0200	110.0000	9020.0000	(28a)																	
WT 1	178.6900	24.5200	154.1700	0.1800	27.7506	110.0000	16958.7000	(29a)																	
RT 1	81.3700		81.3700	0.1100	8.9507	9.0000	732.3300	(30)																	
Total net area of external elements Aum(A, m2)			342.0600					(31)																	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 70.1006			(33)																	
Internal Wall 1			130.1200			9.0000	1171.0800	(32c)																	
Internal Floor 1			81.3700			18.0000	1464.6600	(32d)																	
Internal Ceiling 1			81.3700			9.0000	732.3300	(32e)																	
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 30079.1000	(34)																	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							184.1164	(35)																	
List of Thermal Bridges																									
K1 Element				Length	Psi-value		Total																		
E2 Other lintels (including other steel lintels)				17.5600	0.3510		6.1636																		
E3 Sill				12.2400	0.0050		0.0612																		
E4 Jamb				43.0600	0.0100		0.4306																		
E5 Ground floor (normal)				36.1000	0.1410		5.0901																		
E16 Corner (normal)				19.8000	0.0510		1.0098																		
E6 Intermediate floor within a dwelling				36.1000	-0.0050		-0.1805																		
E10 Eaves (insulation at ceiling level)				36.1000	0.1200		4.3320																		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.9068	(36)																	
Point Thermal bridges							(36a) = 0.0000																		
Total fabric heat loss							(33) + (36) + (36a) = 87.0074	(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	30.7669	30.1832	30.1832	28.4323	27.8486	26.0976	25.8058	25.5140	26.6813	29.0159	29.3077	30.1832	(38)
Heat transfer coeff	117.7742	117.1906	117.1906	115.4396	114.8560	113.1050	112.8132	112.5214	113.6887	116.0233	116.3151	117.1906	117.7742	117.1906	117.1906	115.4396	114.8560	113.1050	112.8132	112.5214	113.6887	116.0233	116.3151	117.1906	(39)
Average = Sum(39)m / 12 =												115.3423											115.3423		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	0.7209	0.7173	0.7173	0.7066	0.7030	0.6923	0.6905	0.6888	0.6959	0.7102	0.7120	0.7173	(40)
HLP (average)												0.7060											0.7060		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	31	28	31	30	31	30	31	30	31	30	31		

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9536 (42)													
Hot water usage for mixer showers	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	73.7418	72.6336	71.0187	67.9290	65.6489	63.1061	61.6607	63.2634	65.0202	67.7503	70.9065	73.4593	(42a)
Hot water usage for baths	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.7270	31.8346	31.3618	30.6960	29.4684	28.5492	27.5300	26.9794	27.6406	28.3604	29.4511	30.7039	31.7270	(42b)
Hot water usage for other uses	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777	44.8777	43.2458	41.6139	39.9819	38.3500	36.7181	36.7181	38.3500	39.9819	41.6139	43.2458	44.8777	(42c)
Average daily hot water use (litres/day)												138.3011 (43)													
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	150.4541	147.2412	143.3286	137.3794	132.5481	127.3542	125.3583	129.2540	133.3625	138.8153	144.8562	150.0640	(44)
Energy conte	238.2825	209.6695	220.2908	188.0655	178.4353	156.5968	151.6100	160.0434	164.4493	188.3710	206.3741	234.9639	238.2825	209.6695	220.2908	188.0655	178.4353	156.5968	151.6100	160.0434	164.4493	188.3710	206.3741	234.9639	(45)
Energy content (annual)												Total = Sum(45)m = 2297.1522													
Distribution loss (46)m = 0.15 x (45)m	35.7424	31.4504	33.0436	28.2098	26.7653	23.4895	22.7415	24.0065	24.6674	28.2557	30.9561	35.2446	35.7424	31.4504	33.0436	28.2098	26.7653	23.4895	22.7415	24.0065	24.6674	28.2557	30.9561	35.2446	(46)
Water storage loss:																									
Store volume												145.0000 (47)													
a) If manufacturer declared loss factor is known (kWh/day):												1.1800 (48)													
Temperature factor from Table 2b												0.7930 (49)													
Enter (49) or (54) in (55)												0.9357 (55)													
Total storage loss	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	28.0718	29.0076	28.0718	29.0076	(56)	
If cylinder contains dedicated solar storage	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	28.0718	29.0076	28.0718	29.0076	29.0076	26.2004	29.0076	28.0718	29.0076	28.0718	29.0076	28.0718	29.0076	28.0718	29.0076	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715	267.2901	235.8699	249.2984	216.1374	207.4428	184.6686	180.6176	189.0510	192.5212	217.3786	234.4460	263.9715	(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	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	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)	
Aperture area of solar collector												3.0000 (H1)													
Zero-loss collector efficiency												0.8000 (H2)													
Collector linear heat loss coefficient												1.8000 (H3)													
Collector 2nd order heat loss coefficient												0.0000 (H4)													
Collector loop efficiency												0.9000 (H5)													
Incidence angle modifier												1.0000 (H6)													
Overshading factor												0.8000 (H8)													
Overall heat loss coefficient of system												6.5000 (H10)													
Heat loss coefficient of collector loop												3.9667 (H11)													
Dedicated solar storage volume												75.0000 (H12)													

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Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													758.2424 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													758.2424
Solar input	-7.2029	-25.4404	-70.8979	-95.7083	-114.0549	-114.6745	-103.2358	-99.3173	-74.1022	-42.6073	-11.0010		-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 (63d)
Output from w/h	260.0872	210.4295	178.4004	120.4291	93.3880	69.9941	77.3817	89.7337	118.4190	174.7713	223.4450		263.9715 (64)
													1880.4505 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 (64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month	102.4350	90.6754	96.4527	84.9893	82.5358	74.5259	73.6164	76.4205	77.1369	85.8394	91.0769		101.3316 (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	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	177.2153	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	44.5651	39.5823	32.1905	24.3703	18.2171	15.3796	16.6182	21.6010	28.9928	36.8130	42.9663	45.8037	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	499.5892	504.7734	491.7094	463.8978	428.7907	395.7949	373.7517	368.5675	381.6315	409.4431	444.5502	477.5460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	55.6751	(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)	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	-118.1435	(71)
Water heating gains (Table 5)	137.6815	134.9337	129.6408	118.0406	110.9352	103.5082	98.9467	102.7157	107.1345	115.3756	126.4957	136.1983	(72)
Total internal gains	796.5826	794.0362	768.2876	721.0556	672.6898	629.4296	604.0635	607.6311	632.5057	676.3785	728.7590	774.2949	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	6.4200	14.1491	0.6300	0.6300	0.7000	1.0000	36.0532 (74)						
East	2.6800	26.5119	0.6300	0.6300	0.7000	1.0000	28.2005 (76)						
South	1.6600	58.6702	0.6300	0.6300	0.7000	1.0000	38.6551 (78)						
West	4.6100	26.5119	0.6300	0.6300	0.7000	1.0000	48.5091 (80)						
East	7.3200	26.5119	0.6300	0.6300	0.7000	1.0000	77.0252 (76)						
Solar gains	228.4431	371.8971	590.0166	869.4151	1002.8078	1124.0737	977.7171	898.8283	719.0887	452.1733	271.7784	182.7141	(83)
Total gains	1025.0257	1165.9333	1358.3042	1590.4708	1675.4976	1753.5034	1581.7807	1506.4594	1351.5944	1128.5518	1000.5374	957.0090	(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	70.9434	71.2967	71.2967	72.3781	72.7459	73.8721	74.0632	74.2553	73.4929	72.0140	71.8334	71.2967	
alpha	5.7296	5.7531	5.7531	5.8252	5.8497	5.9248	5.9375	5.9504	5.8995	5.8009	5.7889	5.7531	
util living area	0.9791	0.9599	0.9085	0.7887	0.6374	0.4493	0.3773	0.3802	0.5551	0.8282	0.9508	0.9819	(86)
Living	20.4440	20.5537	20.7058	20.8561	20.9230	20.9449	20.9469	20.9470	20.9394	20.8547	20.6552	20.4460	
Non living	19.6752	19.8139	19.9975	20.1768	20.2492	20.2785	20.2817	20.2834	20.2713	20.1777	19.9457	19.6809	
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	20.7156	20.5537	20.7058	20.8561	20.9230	20.9449	20.9469	20.9470	20.9394	20.8547	20.6552	20.5235	(87)
Th 2	20.3224	20.3255	20.3255	20.3350	20.3381	20.3476	20.3492	20.3508	20.3445	20.3318	20.3303	20.3255	(88)
util rest of house	0.9743	0.9512	0.8914	0.7591	0.5987	0.4082	0.3313	0.3321	0.5038	0.7917	0.9381	0.9775	(89)
MIT 2	20.0644	19.8139	19.9975	20.1768	20.2492	20.2785	20.2817	20.2834	20.2713	20.1777	19.9457	19.7971	(90)
Living area fraction													0.1102 (91)
MIT	20.1361	19.8954	20.0755	20.2516	20.3234	20.3519	20.3550	20.3565	20.3449	20.2523	20.0239	19.8771	(92)
Temperature adjustment													0.0000
adjusted MIT	20.1361	19.8954	20.0755	20.2516	20.3234	20.3519	20.3550	20.3565	20.3449	20.2523	20.0239	19.8771	(93)

8. Space heating requirement

Utilisation	0.9727	0.9447	0.8843	0.7552	0.5978	0.4085	0.3317	0.3326	0.5038	0.7870	0.9313	0.9739	(94)
Useful gains	997.0897	1101.4892	1201.1793	1201.1666	1001.6607	716.2830	524.6383	500.9742	680.9338	888.1948	931.7679	932.0305	(95)
Ext temp.	6.3000	6.6000	7.5000	9.0000	11.4000	14.0000	15.7000	15.9000	14.3000	11.8000	9.2000	6.8000	(96)
Heat loss rate W	1629.5381	1558.0996	1473.7325	1298.8857	1024.9109	718.4327	525.1417	501.4551	687.2413	980.6604	1258.9804	1532.5147	(97)
Space heating kWh	470.5416	306.8422	202.7796	70.3578	17.2982	0.0000	0.0000	0.0000	0.0000	68.7944	235.5930	446.7602	(98a)
Space heating requirement - total per year (kWh/year)													1818.9669
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	470.5416	306.8422	202.7796	70.3578	17.2982	0.0000	0.0000	0.0000	0.0000	68.7944	235.5930	446.7602	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													1818.9669
Space heating per m2													(98c) / (4) = 11.1340 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													362.1708 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
Space heating requirement	470.5416	306.8422	202.7796	70.3578	17.2982	0.0000	0.0000	0.0000	0.0000	68.7944	235.5930	446.7602	(98)
Space heating efficiency (main heating system 1)	362.1708	362.1708	362.1708	362.1708	362.1708	0.0000	0.0000	0.0000	0.0000	362.1708	362.1708	362.1708	(210)
Space heating fuel (main heating system)	129.9226	84.7231	55.9901	19.4267	4.7762	0.0000	0.0000	0.0000	0.0000	18.9950	65.0503	123.3562	(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	260.0872	210.4295	178.4004	120.4291	93.3880	69.9941	77.3817	89.7337	118.4190	174.7713	223.4450	263.9715	(64)
Efficiency of water heater (217)m	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	177.2172	(216)
Fuel for water heating, kWh/month	146.7618	118.7411	100.6677	67.9557	52.6969	39.4963	43.6649	50.6349	66.8214	98.6199	126.0854	148.9536	(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	35.3623	31.9401	35.3623	34.2215	35.3623	34.2215	35.3623	34.2215	35.3623	34.2215	35.3623	34.2215	(231)
Lighting	39.0076	31.2933	28.1762	20.6431	15.9453	13.0274	14.5458	18.9072	24.5586	32.2222	36.3949	40.0917	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-116.2332	-163.3110	-264.7459	-336.2800	-367.9940	-370.4758	-346.0989	-332.8695	-284.7565	-209.3474	-131.3601	-94.0153	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	(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	-2.5214	-6.9729	-23.0418	-57.8897	-89.1610	-119.9686	-96.7931	-83.0181	-49.0453	-16.6740	-4.4109	-1.6060	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-91.1028	-82.2864	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	-91.1028	-88.1640	-91.1028	-88.1640	-91.1028	(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													502.2401 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													177.2172
Water heating fuel used													1061.0995 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6820)													
mechanical ventilation fans (SFP = 0.6820)													336.3622 (230a)
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													416.3622 (231)
Electricity for lighting (calculated in Appendix L)													314.8135 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3568.5901 (233)
Wind generation													-3575.5408 (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													-4849.6156 (238)

10a. Fuel costs - using BEDF prices (540)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	502.2401	25.1600	126.3636 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1061.0995	25.1600	266.9726 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	336.3622	25.1600	84.6287 (249)
Pump for solar water heating	80.0000	25.1600	20.1280 (249)
Energy for lighting	314.8135	25.1600	79.2071 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3017.4875	25.1600	-759.1998
PV Unit electricity exported	-551.1026	5.8100	-32.0191
Total			-791.2189 (252)
Wind Turbine electricity used in dwelling	-2502.8785	25.1600	-629.7242
Wind Turbine electricity exported	-1072.6622	5.8100	-62.3217
Total			-692.0459 (252)
Total energy cost			-905.9648 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	502.2401	0.1577	79.2210 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1061.0995	0.1462	155.1369 (264)
Space and water heating			234.3579 (265)

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Pumps, fans and electric keep-hot	416.3622	0.1387	57.7546 (267)
Energy for lighting	314.8135	0.1443	45.4373 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3017.4875	0.1328	-400.7720
PV Unit electricity exported	-551.1026	0.1167	-64.3104
Total			-465.0824 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	-1072.6622	0.1387	-148.7915
Total			-495.9716 (269)
Total CO2, kg/year			-623.5042 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	502.2401	1.5839	795.4975 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1061.0995	1.5408	1634.9862 (278)
Space and water heating			2430.4837 (279)
Pumps, fans and electric keep-hot	416.3622	1.5128	629.8727 (281)
Energy for lighting	314.8135	1.5338	482.8714 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3017.4875	1.4908	-4498.3268
PV Unit electricity exported	-551.1026	0.4278	-235.7890
Total			-4734.1158 (283)
Wind Turbine electricity used in dwelling	-2502.8785	1.5128	-3786.3546
Wind Turbine electricity exported	-1072.6622	0.5128	-550.0612
Total			-4336.4158 (283)
Total Primary energy kWh/year			-5527.3038 (286)