

**KG Designs**

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Our Ref : EC-24

Sent By : E-Mail

21 April 2026

Dear Dave

ENERGY STATEMENT (PLANNING)

Report By :

Joe Solti Accredited Assessor (EES/003578)

Further to receipt of drawings, we are pleased to present our report as follows.

Development Details

Site Location :

Hopelands Farm, Polecat Lane, Copsale, West Sussex RH13 6QR

Development :

2 Bedroom Dwelling (Conversion)

Local Authority :

Horsham District Council

Planning Policy (36) :

Appropriate Energy Use (Energy Hierarchy)

Planning Policy (37) :

(1) Maximise Energy Efficiency and Integrate Decentralised,
Renewable and Low Carbon Energy

(2) Limit Water Use to 110 Litres/Person/Day

EC-24

Site Location :

Hopelands Farm, Polecat Lane, Copsale, West Sussex RH13 6QR

POLICY 36

Strategic Policy : Appropriate Energy Use

Energy Hierarchy

All development will be required to contribute to clean, efficient energy in Horsham based on the following hierarchy :

- (1) Lean - use less energy - eg through demand reduction
- (2) Clean - supply energy efficiently - eg through heat networks
- (3) Green - use renewable energy sources

District Heating & Cooling

Commercial and residential developments in Heat Priority Areas or the strategic development locations will be expected to connect to district heating networks where they exist using the following hierarchy, or incorporate the necessary infrastructure for connection to future network.

Development should demonstrate that the heating and cooling systems have been selected in accordance with the following heating and cooling hierarchy :

- (1) Connection to existing (C)CHP distribution networks (not available)
- (2) Site wide renewable (C)CHP (not suitable - single dwelling)
- (3) Site wide gas-fired (C)CHP (not suitable -single dwelling)
- (4) Site wide renewable community heating/cooling (not suitable - single dwelling)
- (5) Site wide gas-fired community heating/cooling (not suitable - single dwelling)

(6) Individual building renewable heating

- (7) Individual building heating, with the exception of electric heating

All (C)CHP must be of a scale and operated to maximise the potential for carbon reduction. Where site-wide (C)CHP is proposed, consideration must be given to extending the network to adjacent sites.

Energy Statements

All applications for residential or commercial development must include an Energy Statement demonstrating and quantifying how the development will comply with the Energy Hierarchy.

EC-24

Site Location :

Hopelands Farm, Polecat Lane, Copsale, West Sussex RH13 6QR

BASELINE CO2

Calculations (SAP) :

Part L1 Compliant

Total Emissions :

5.75 kg CO2 per m2

Total Emissions :

690.00 kg CO2 per year

BE LEAN CO2

Calculations (SAP) :

Energy Efficiency Measures

Total Emissions :

5.36 kg CO2 per m2

Total Emissions :

643.20 kg CO2 per year

CO2 Saving :

46.80 kg CO2 per year = 6.78 %

BE CLEAN CO2

Calculations (SAP) :

Heat Networks (Not Available)

Total Emissions :

5.36 kg CO2 per m2

Total Emissions :

643.20 kg CO2 per year

CO2 Saving :

0.00 kg CO2 per year = 0.00 %

BE GREEN CO2

Calculations (SAP) :

Renewables (Solar PV - upgraded to min 8 kW peak + battery)

Total Emissions :

2.37 kg CO2 per m2

Total Emissions :

284.40 kg CO2 per year

CO2 Saving :

358.80 kg CO2 per year = 55.78 %

EC-24

Site Location :

Hopelands Farm, Polecat Lane, Copsale, West Sussex RH13 6QR

POLICY 37

Sustainable Construction

Proposals must seek to improve the sustainability of development. To deliver sustainable design, development should incorporate the following measures where appropriate according to the type of development and location :

(1) Maximise energy efficiency and integrate the use of decentralised, renewable and low carbon energy.

(2) Limit water use to 110 litres/person/day

(3)-(8) By others

All new development will be required to provide satisfactory arrangements for the storage of refuse and recyclable materials as an integral part of the design.

New homes and workplaces should include the provision of high-speed broadband access and enable provision of future technologies where available.

1. Maximise Energy Efficiency & Integrate Decentralised, Renewables and Low Carbon Energy

The building is to be designed with a "fabric first approach" to minimise energy requirements, incorporating excellent fabric insulation and air-tightness, advanced detailing, and low energy use ventilation and lighting (ie LEDs).

Heating is to be by air source heat pump (preferably Products Characteristic Database listed), MCS installer, with advanced heating controls.

The existing solar system (approx 12-15 years old) is to be replaced (minimum 8kW with battery storage) to reduce energy use and carbon emissions.

See SAP Calculations attached to this report.

2. Limit Water Use to 110 Litres/Person/Day

Water use is to be reduced and suitably minimised by the fitting of low water use sanitary fittings (taps/showers), dual flush WCs, and low water use (and energy efficient) dishwashers and washing machines.

See Water Efficiency Calculation attached to this report.

Construction and Insulation

<u>Element</u>	<u>U-Value</u> (W/m ² K)
<u>Exposed Wall</u> Cladding + timber battens + 200mm PIR insulation + 140mm block + plaster.	0.18
<u>Ground Floor</u> 75mm screed + 90mm PIR insulation + concrete floor slab.	0.18
<u>Roof</u> Tiles + battens + Alumaflex multi-foil insulation + 120mm PIR insulation between 195mm timber rafters.	0.15
<u>Windows, Doors & Rooflights</u> (existing) PVC-u frame double-glazed (approx 12-15 years old).	1.80
<u>Windows, Doors & Rooflights</u> (new) PVC-u frame double-glazed + 16mm cavity (argon gas fill) + soft coat low-E glass + warm edge spacer, or similar to achieve U-value of 1.20W/m ² K (or better).	1.40

Heating, Ventilation & Renewables

<u>Main Heating System</u> Electric air source heat pump (radiators). MCS installer. Hopelands Farm, Polecat Lane, Copsale, West Sussex RH13 6QR
<u>Water Heating</u> From electric air source heat pump. Hot water cylinder (factory PIR insulation, heat loss TBC kWh/day) + thermostat.
<u>Heating Controls</u> Programmer + at least 2 room thermostats.
<u>Ventilation</u> Background ventilators + intermittent extract fans (Approved Document F1, 2010).
<u>Solar PV</u> Solar PV panels = 8.00 kW/peak, on south-facing (export capable meter) + battery storage. Note : An average performance solar PV panel has been allowed for.

Other

<u>Lighting</u> Low energy lighting with minimum luminous efficacy of 75 light source lumens/circuit-watt (per light fitting).

Full SAP Calculation Printout



Plot Reference	EC2401			Issued on Date	21/04/2026
Assessment Reference	EC2401A (BASE CO2)	Plot Type Ref	EC-24		
Plot Address	2 Bedroom Dwelling, Polecat Lane, Copsale, West Sussex, RH13 6QR			SAP Version	10.2
SAP Rating	75 C	DER	5.75	TER	
Environmental	95 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.57	DFEE	90.21	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	58.03	TPER	
Assessor Details	Mr. Joe Solti			Assessor ID	5122-0001
Client	KG Designs, .				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
Effective ac	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.2500	18.8750	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.3000	10.6500	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1600	8.9600	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1600	4.9600	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.3032		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)

$$\begin{aligned} (33) + (36) + (36a) &= 152.8032 \quad (37) \end{aligned}$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	98.1005	96.1770	94.2534	84.7621	82.9615	74.5796	74.5796	73.0274	77.8082	82.9615	86.6040	90.4063	(38)
Heat transfer coeff													
Average = Sum(39)m / 12 =	250.9036	248.9801	247.0566	237.5652	235.7647	227.3827	227.3827	225.8305	230.6113	235.7647	239.4072	243.2095	(39) 237.4882

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)
Energy conte	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Energy content (annual)										Total =	Sum(45)m =	2388.2662

[illegible]

Total per year (kWh/year) = Sum(64)m =											3056.3022 (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	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978 (65)

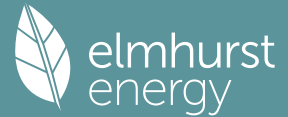
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.5482	164.4640	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	153.4998	148.5482	153.4998	148.5482 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166 (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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
Total internal gains	671.4189	687.4784	658.6270	635.6244	603.2486	581.6403	559.3295	560.2672	577.2521	596.7471	633.3142	657.2850 (73)

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

North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
South	3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)
West	8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)
North	1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)

7. Mean internal temperature (heating season)

Full SAP Calculation Printout



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	29.6395	29.8685	30.1011	31.3037	31.5428	32.7055	32.7055	32.9303	32.2476	31.5428	31.0628	30.5772
alpha	2.9760	2.9912	3.0067	3.0869	3.1029	3.1804	3.1804	3.1954	3.1498	3.1029	3.0709	3.0385
util living area	0.9935	0.9890	0.9807	0.9582	0.9088	0.8032	0.6744	0.7219	0.8870	0.9695	0.9895	0.9945 (86)
MIT	18.2331	18.4879	18.9165	19.5678	20.1513	20.6469	20.8595	20.8217	20.4457	19.6905	18.9026	18.2583 (87)
Th 2	19.2734	19.2839	19.2944	19.3469	19.3570	19.4044	19.4044	19.4132	19.3860	19.3570	19.3366	19.3156 (88)
util rest of house	0.9912	0.9852	0.9734	0.9404	0.8632	0.6927	0.4826	0.5412	0.8106	0.9530	0.9852	0.9926 (89)
MIT 2	16.8613	17.1210	17.5527	18.2255	18.7839	19.2381	19.3704	19.3633	19.0784	18.3602	17.5690	16.9131 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.4958	17.7532	18.1834	18.8463	19.4163	19.8897	20.0591	20.0378	19.7108	18.9755	18.1858	17.5353 (92)
Temperature adjustment												
adjusted MIT	17.4958	17.7532	18.1834	18.8463	19.4163	19.8897	20.0591	20.0378	19.7108	18.9755	18.1858	17.5353 (93)

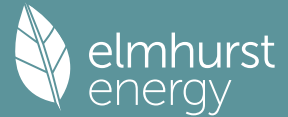
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9877	0.9801	0.9665	0.9331	0.8653	0.7320	0.5708	0.6226	0.8299	0.9476	0.9807	0.9895 (94)
Useful gains	820.6454	953.2852	1046.9009	1134.7900	1125.8138	947.8284	706.8485	715.4227	876.0419	873.0859	810.8197	783.7859 (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	3310.8646	3200.1960	2886.4674	2362.8985	1819.2360	1202.7761	786.5374	821.5307	1293.9161	1974.6358	2654.0123	3243.2648 (97)
Space heating kWh	1852.7231	1509.9241	1368.6375	884.2381	515.9061	0.0000	0.0000	0.0000	0.0000	819.5531	1327.0986	1829.8523 (98a)
Space heating requirement - total per year (kWh/year)												10107.9329
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	1852.7231	1509.9241	1368.6375	884.2381	515.9061	0.0000	0.0000	0.0000	0.0000	819.5531	1327.0986	1829.8523 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10107.9329
Space heating per m2												(98c) / (4) = 84.2328 (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 %)													219.3000 (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	1852.7231	1509.9241	1368.6375	884.2381	515.9061	0.0000	0.0000	0.0000	0.0000	819.5531	1327.0986	1829.8523	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	844.8350	688.5199	624.0937	403.2094	235.2513	0.0000	0.0000	0.0000	0.0000	373.7132	605.1521	834.4060	(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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-118.1716	-166.1178	-232.5240	-244.4355	-238.9364	-169.9965	-167.7918	-163.0563	-152.1950	-175.7558	-127.8290	-102.4583	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4609.1805	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1605.2322	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.8716	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2059.2679	(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													

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4410.0165 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	4609.1805	0.1541	710.2809 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			936.5412 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2059.2679	0.1378	-283.6711
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-283.6711 (269)
Total CO ₂ , kg/year			689.6559 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7500 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	4609.1805	1.5705	7238.8246 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			9680.6896 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2059.2679	1.5093	-3108.1368
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3108.1368 (283)
Total Primary energy kWh/year			6963.4835 (286)
Dwelling Primary energy Rate (DPER)			58.0300 (287)

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

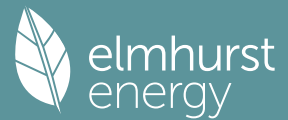
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (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) = 0.1477 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.8977 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8977 (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	1.1445 1.1221 1.0996 0.9874 0.9650 0.8528 0.8528 0.8303 0.8977 0.9650 1.0099 1.0548 (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	1.1445 1.1221 1.0996 0.9875 0.9656 0.8636 0.8636 0.8447 0.9029 0.9656 1.0099 1.0548 (25)	

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
Front Door			2.1000	3.0000	6.3000			(26)					
Windows (existing)			4.4000	1.6791	7.3881			(27)					
Windows (new)			13.8000	1.3258	18.2955			(27)					
Roof Windows			1.5000	1.3258	1.9886			(27a)					
Ground Floor			75.5000	0.2500	18.8750	110.0000	8305.0000	(28a)					
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000	(29a)					
Wall (ashlar)	35.5000		35.5000	0.3000	10.6500	9.0000	319.5000	(29a)					
Roof (pitched)	57.5000	1.5000	56.0000	0.1600	8.9600	9.0000	504.0000	(30)					
Roof (ceiling)	31.0000		31.0000	0.1600	4.9600	9.0000	279.0000	(30)					
Total net area of external elements Aum(A, m2)			302.5000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.3032			(33)					
Main dwelling													
Internal Wall			50.0000			9.0000	450.0000	(32c)					
Internal Floor			44.5000			18.0000	801.0000	(32d)					
Internal Ceiling			44.5000			9.0000	400.5000	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000	(35)					
Thermal bridges (Default value 0.200 * total exposed area)							60.5000	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	152.8032	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 102.3080	Feb 100.3020	Mar 98.2959	Apr 88.2728	May 86.3144	Jun 77.1981	Jul 77.1981	Aug 75.5099	Sep 80.7096	Oct 86.3144	Nov 90.2718	Dec 94.2838	(38)
Heat transfer coeff	255.1111	253.1051	251.0991	241.0759	239.1176	230.0012	230.0012	228.3130	233.5127	239.1176	243.0749	247.0870	(39)
Average = Sum(39)m / 12 =												240.8847	
HLP	Jan 2.1259	Feb 2.1092	Mar 2.0925	Apr 2.0090	May 1.9926	Jun 1.9167	Jul 1.9167	Aug 1.9026	Sep 1.9459	Oct 1.9926	Nov 2.0256	Dec 2.0591	(40)
HLP (average)												2.0074	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8633	(42)
Hot water usage for mixer showers														(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
Hot water usage for baths														(42b)
31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783			
Hot water usage for other uses														(42c)
43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532			
Average daily hot water use (litres/day)													68.8697	(43)
Daily hot water use	Jan 75.1369	Feb 73.0755	Mar 70.8250	Apr 68.0242	May 65.5255	Jun 62.9288	Jul 62.3895	Aug 64.6354	Sep 66.9389	Oct 69.6055	Nov 72.4310	Dec 75.0315	(44)	
Energy conte	118.9985	104.0585	108.8554	93.1218	88.2100	77.3783	75.4547	80.0322	82.5423	94.4540	103.1913	117.4812	(45)	
Energy content (annual)										Total = Sum(45)m =		1143.7782		
Distribution loss (46)m = 0.15 x (45)m													(46)	
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		
Water storage loss (or HIU loss):													(46)	
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage													(57)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														
101.1487	88.4497	92.5271	79.1535	74.9785	65.7716	64.1365	68.0273	70.1610	80.2859	87.7126	99.8590		(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	101.1487	88.4497	92.5271	79.1535	74.9785	65.7716	64.1365	68.0273	70.1610	80.2859	87.7126	99.8590	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		972.2114	(64)	
Electric shower(s)	57.8427	51.5384	56.2779	53.7053	54.7131	52.1910	53.9307	54.7131	53.7053	56.2779	55.2197	57.8427	(64a)	
												657.9578	(64a)	
Heat gains from water heating, kWh/month	39.7479	34.9970	37.2013	33.2147	32.4229	29.4906	29.5168	30.6851	30.9666	34.1410	35.7331	39.4254	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	Jan 143.1657	Feb 143.1657	Mar 143.1657	Apr 143.1657	May 143.1657	Jun 143.1657	Jul 143.1657	Aug 143.1657	Sep 143.1657	Oct 143.1657	Nov 143.1657	Dec 143.1657	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													(67)	
148.5482	164.4640	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													(68)	
285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288		(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													(69)	
37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	(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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)	
Water heating gains (Table 5)	53.4246	52.0789	50.0017	46.1315	43.5791	40.9592	39.6731	41.2434	43.0091	45.8884	49.6293	52.9912	(72)	
Total internal gains	553.1356	570.6655	545.2142	530.4182	502.8717	486.3662	467.5441	466.1548	480.3303	494.1354	522.8704	540.1179	(73)	

6. Solar gains

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

North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
South	3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)
West	8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)
North	1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)

Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	712.5716	855.8481	969.7216	1110.9241	1200.6904	1199.5010	1146.6508	1055.0095	958.6312	818.7498	716.3597	674.9061 (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	29.1507	29.3817	29.6165	30.8478	31.1005	32.3332	32.3332	32.5722	31.8469	31.1005	30.5941	30.0974
alpha	2.9434	2.9588	2.9744	3.0565	3.0734	3.1555	3.1555	3.1715	3.1231	3.0734	3.0396	3.0065
util living area	0.9957	0.9922	0.9856	0.9670	0.9247	0.8306	0.7100	0.7586	0.9093	0.9777	0.9929	0.9964 (86)
MIT	18.0971	18.3554	18.7925	19.4635	20.0690	20.5971	20.8324	20.7877	20.3767	19.5900	18.7822	18.1241 (87)
Th 2	19.2507	19.2615	19.2724	19.3274	19.3382	19.3895	19.3895	19.3991	19.3696	19.3382	19.3163	19.2943 (88)
util rest of house	0.9942	0.9894	0.9799	0.9523	0.8847	0.7261	0.5162	0.5798	0.8424	0.9651	0.9899	0.9952 (89)
MIT 2	16.7117	16.9757	17.4170	18.1135	18.6993	19.1941	19.3474	19.3370	19.0131	18.2519	17.4370	16.7661 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.3524	17.6138	18.0532	18.7379	19.3328	19.8430	20.0342	20.0080	19.6438	18.8708	18.0591	17.3942 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.3524	17.6138	18.0532	18.7379	19.3328	19.8430	20.0342	20.0080	19.6438	18.8708	18.0591	17.3942 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9916	0.9853	0.9741	0.9451	0.8846	0.7614	0.6049	0.6595	0.8570	0.9599	0.9864	0.9930 (94)
Useful gains	706.5684	843.2998	944.6011	1049.9650	1062.0945	913.2656	693.6068	695.7838	821.5712	785.9357	706.6432	670.1976 (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	3329.8237	3217.9320	2900.9861	2371.6700	1825.1331	1205.8917	789.8696	823.7506	1294.5445	1977.6892	2663.8929	3260.1149 (97)
Space heating kWh	1951.7019	1595.7528	1455.5504	951.6276	567.7007	0.0000	0.0000	0.0000	0.0000	886.6646	1409.2198	1926.8985 (98a)
Space heating requirement - total per year (kWh/year)	10745.1163											
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	1951.7019	1595.7528	1455.5504	951.6276	567.7007	0.0000	0.0000	0.0000	0.0000	886.6646	1409.2198	1926.8985 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	10745.1163											
Space heating per m2	(98c) / (4) = 89.5426 (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	2162.0117	1702.0092	1735.1791	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.5528	0.6366	0.5933	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1195.1116	1083.4932	1029.5099	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1319.2419	1261.8808	1162.0020	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	89.3738	132.7204	98.5741	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	22.3435	33.1801	24.6435	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	80.1671 (107)											
Energy for space heating	89.5426 (99)											
Energy for space cooling	0.6681 (108)											
Total	90.2107 (109)											
Fabric Energy Efficiency (DFEE)	90.2 (109)											

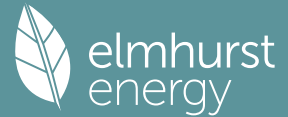
SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)

CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		
Dwelling volume	(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 270.8750 (5)		

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2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												3 * 10 = 30.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											30.0000 / (5) = 0.1108 (8)
Pressure test												No
Pressure Test Method												Blower Door
Measured/design AP50												15.0000 (17)
Infiltration rate												0.8608 (18)
Number of sides sheltered												0 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

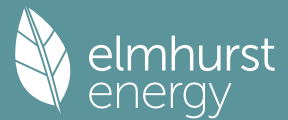
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1000	3.0000	6.3000			(26)
Windows (existing)			4.4000	1.6791	7.3881			(27)
Windows (new)			13.8000	1.3258	18.2955			(27)
Roof Windows			1.5000	1.3258	1.9886			(27a)
Ground Floor			75.5000	0.2500	18.8750	110.0000	8305.0000	(28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000	(29a)
Wall (ashlar)	35.5000		35.5000	0.3000	10.6500	9.0000	319.5000	(29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1600	8.9600	9.0000	504.0000	(30)
Roof (ceiling)	31.0000		31.0000	0.1600	4.9600	9.0000	279.0000	(30)
Total net area of external elements Aum(A, m2)			302.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.3032			(33)
Main dwelling								
Internal Wall			50.0000			9.0000	450.0000	(32c)
Internal Floor			44.5000			18.0000	801.0000	(32d)
Internal Ceiling			44.5000			9.0000	400.5000	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	152.8032	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454 (42a)
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783 (42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532 (42c)
Average daily hot water use (litres/day)												143.7856 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2388.2662
	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333 (46)
Water storage loss (or HIU loss):												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

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Total heat required for water heating calculated for each month												
	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Total per year (kWh/year) = Sum(64)m =												3056.3622 (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	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978 (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	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432 (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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
Total internal gains	745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589 (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					1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)		
South					3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)		
North					1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)		
East					1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)		
South					2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)		
West					8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)		
North					1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)		
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	905.2243	1028.5383	1145.2697	1259.1626	1334.1978	1311.3788	1254.7961	1168.0580	1079.1954	964.1069	879.4507	861.2472 (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	29.6395	29.8685	30.1011	31.3037	31.5428	32.7055	32.7055	32.9303	32.2476	31.5428	31.0628	30.5772
alpha	2.9760	2.9912	3.0067	3.0869	3.1029	3.1804	3.1804	3.1954	3.1498	3.1029	3.0709	3.0385
util living area	0.9918	0.9872	0.9777	0.9545	0.9036	0.7988	0.6688	0.7152	0.8817	0.9657	0.9876	0.9930 (86)
MIT	18.2926	18.5320	18.9640	19.5984	20.1708	20.6533	20.8629	20.8267	20.4586	19.7223	18.9447	18.3144 (87)
Th 2	19.2734	19.2839	19.2944	19.3469	19.3570	19.4044	19.4044	19.4132	19.3860	19.3570	19.3366	19.3156 (88)
util rest of house	0.9890	0.9828	0.9694	0.9353	0.8563	0.6874	0.4773	0.5343	0.8031	0.9475	0.9825	0.9907 (89)
MIT 2	16.9202	17.1644	17.5989	18.2541	18.8002	19.2419	19.3714	19.3652	19.0878	18.3899	17.6104	16.9688 (90)
Living area fraction	17.5549	17.7969	18.2302	18.8758	19.4341	19.8947	20.0612	20.0411	19.7218	19.0062	18.2275	17.5912 (92)
Temperature adjustment	17.5549	17.7969	18.2302	18.8758	19.4341	19.8947	20.0612	20.0411	19.7218	19.0062	18.2275	17.5912 (93)
adjusted MIT	17.5549	17.7969	18.2302	18.8758	19.4341	19.8947	20.0612	20.0411	19.7218	19.0062	18.2275	17.5912 (93)

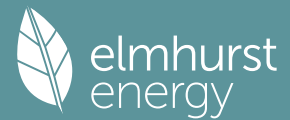
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9848	0.9772	0.9620	0.9280	0.8591	0.7273	0.5654	0.6159	0.8235	0.9421	0.9775	0.9870 (94)
Useful gains	891.4384	1005.0843	1101.7305	1168.5467	1146.2279	953.7918	709.4369	719.3900	888.7400	908.2792	859.6387	850.0651 (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	3325.7150	3211.0783	2898.0334	2369.9087	1823.4325	1203.9192	787.0279	822.2764	1296.4486	1981.8741	2664.0007	3256.8612 (97)
Space heating kWh	1811.1018	1482.4279	1336.4494	864.9806	503.8403	0.0000	0.0000	0.0000	0.0000	798.7546	1299.1406	1790.6563 (98a)
Space heating requirement - total per year (kWh/year)												9887.3515
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	1811.1018	1482.4279	1336.4494	864.9806	503.8403	0.0000	0.0000	0.0000	0.0000	798.7546	1299.1406	1790.6563 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9887.3515
Space heating per m ²										(98c) / (4) =		82.3946 (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)

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Efficiency of main space heating system 1 (in %)												219.3000	(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	1811.1018	1482.4279	1336.4494	864.9806	503.8403	0.0000	0.0000	0.0000	0.0000	798.7546	1299.1406	1790.6563	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	825.8558	675.9817	609.4160	394.4280	229.7493	0.0000	0.0000	0.0000	0.0000	364.2292	592.4034	816.5328	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(217)m	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	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)
Lighting	-117.8754	-165.6673	-231.5357	-243.3672	-237.8931	-169.9965	-167.7918	-163.0563	-152.1950	-175.0589	-127.4879	-102.2302	(233a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													4508.5962 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													190.4000
Water heating fuel used													1605.2322 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													254.8716 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2054.1554 (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													4314.5447 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4508.5962	16.4900	743.4675	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1605.2322	16.4900	264.7028	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	254.8716	16.4900	42.0283	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2054.1554	16.4900	-338.7302	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-338.7302	(252)
Total energy cost			711.4684	(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] =	1.5523	(257)
SAP value		74.8373	
SAP rating (Section 12)		75	(258)
SAP band		C	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4508.5962	0.1541	694.8253	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1605.2322	0.1410	226.2603	(264)
Space and water heating			921.0856	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)

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Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2054.1554	0.1377	-282.9256
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-282.9256 (269)
Total CO ₂ , kg/year			674.9458 (272)
CO ₂ emissions per m ²			5.6200 (273)
EI value			94.5186
EI rating			95 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	3.9000	3.7000	3.7000	3.3000	3.4000	3.1000	3.2000	3.5000	3.4000	3.8000 (22)
Wind factor	1.0500	0.9750	0.9750	0.9250	0.9250	0.8250	0.8500	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)
Adj infilt rate	0.9038	0.8392	0.8392	0.7962	0.7962	0.7101	0.7316	0.6671	0.6886	0.7532	0.7316	0.8177 (22b)
Effective ac	0.9084	0.8522	0.8522	0.8170	0.8170	0.7521	0.7676	0.7225	0.7371	0.7836	0.7676	0.8343 (25)

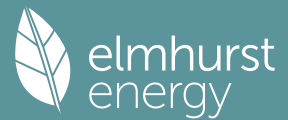
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.2500	18.8750	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.3000	10.6500	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1600	8.9600	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1600	4.9600	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.3032		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		60.5000 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	152.8032 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 81.2023	Feb 76.1732	Mar 76.1732	Apr 73.0274	May 73.0274	Jun 67.2325	Jul 68.6191	Aug 64.5834	Sep 65.8872	Oct 70.0471	Nov 68.6191	Dec 74.5796 (38)
Heat transfer coeff	234.0055	228.9763	228.9763	225.8305	225.8305	220.0356	221.4223	217.3865	218.6904	222.8503	221.4223	227.3827 (39)
Average = Sum(39)m / 12 =												224.4008
HLP	Jan 1.9500	Feb 1.9081	Mar 1.9081	Apr 1.8819	May 1.8819	Jun 1.8336	Jul 1.8452	Aug 1.8116	Sep 1.8224	Oct 1.8571	Nov 1.8452	Dec 1.8949 (40)

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	1.8700
Days in mont												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers												
81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454	(42a)
Hot water usage for baths												
31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses												
43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)												143.7856 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy conte	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss												
33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage												
33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(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												
127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)												
171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583	(72)
Total internal gains												
745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589	(73)

6. Solar gains												

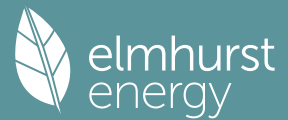
[Jan]												
			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
North			1.2500	12.6907	0.6300	0.7000	0.7700	4.8481 (74)				
South			3.1500	53.4173	0.6300	0.7000	0.7700	51.4238 (78)				
North			1.2500	12.6907	0.6300	0.7000	0.7700	4.8481 (74)				
East			1.4500	23.7106	0.6300	0.7000	0.7700	10.5071 (76)				
South			2.4500	53.4173	0.6300	0.7000	0.7700	39.9963 (78)				
West			8.6500	23.7106	0.6300	0.7000	0.7700	62.6803 (80)				
North			1.5000	18.5195	0.6300	0.8000	1.0000	12.6007 (82)				

Solar gains	186.9043	293.1166	436.0512	617.8060	725.5033	806.1518	750.7118	656.5570	525.4479	354.1873	223.6333	152.7020 (83)
Total gains	932.6926	1036.4722	1156.8135	1296.4627	1361.8824	1404.3958	1326.4012	1235.7603	1126.3424	993.6799	909.5947	879.1610 (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	31.7799	32.4779	32.4779	32.9303	32.9303	33.7976	33.5859	34.2094	34.0055	33.3707	33.5859	32.7055
alpha	3.1187	3.1652	3.1652	3.1954	3.1954	3.2532	3.2391	3.2806	3.2670	3.2247	3.2391	3.1804
util living area												
0.9905	0.9863	0.9747	0.9449	0.8788	0.7340	0.5946	0.6079	0.8458	0.9554	0.9845	0.9920	(86)
MIT	18.5853	18.7981	19.2177	19.7922	20.3456	20.7702	20.9167	20.9167	20.5963	19.9433	19.2423	18.6095 (87)
Th 2	19.3668	19.3953	19.3953	19.4132	19.4132	19.4466	19.4385	19.4619	19.4303	19.4303	19.4385	19.4044 (88)
util rest of house												
0.9872	0.9816	0.9653	0.9219	0.8203	0.6037	0.3936	0.4016	0.7506	0.9314	0.9781	0.9892	(89)

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MIT 2	17.2714	17.5009	17.9154	18.4855	18.9963	19.3532	19.4233	19.4471	19.2494	18.6526	17.9723	17.3202 (90)
Living area fraction									FLA = Living area / (4) =			0.4625 (91)
MIT	17.8791	18.1009	18.5177	19.0899	19.6204	20.0086	20.1140	20.1268	19.8723	19.2496	18.5597	17.9165 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8791	18.1009	18.5177	19.0899	19.6204	20.0086	20.1140	20.1268	19.8723	19.2496	18.5597	17.9165 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9828	0.9761	0.9582	0.9159	0.8296	0.6567	0.4878	0.4987	0.7815	0.9276	0.9729	0.9854	(94)
Useful gains	916.6336	1011.7114	1108.4540	1187.4254	1129.7884	922.2457	647.0847	616.2582	880.2701	921.7768	884.9314	866.3428	(95)
Ext temp.	4.8000	5.2000	6.9000	9.3000	12.3000	15.1000	17.0000	17.1000	14.5000	11.2000	7.7000	4.8000	(96)
Heat loss rate W	3060.5748	2953.9964	2660.1815	2210.8525	1653.1643	1080.0575	689.5080	657.9773	1174.8748	1793.8490	2404.5778	2982.4656	(97)
Space heating kWh	1595.0923	1305.2155	1154.4853	736.8676	389.3917	0.0000	0.0000	0.0000	0.0000	648.8217	1094.1454	1574.3954	(98a)
Space heating requirement - total per year (kWh/year)												8498.4148	
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	1595.0923	1305.2155	1154.4853	736.8676	389.3917	0.0000	0.0000	0.0000	0.0000	648.8217	1094.1454	1574.3954	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8498.4148	
Space heating per m2											(98c) / (4) =	70.8201	(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 %)													219.3000 (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	1595.0923	1305.2155	1154.4853	736.8676	389.3917	0.0000	0.0000	0.0000	0.0000	648.8217	1094.1454	1574.3954	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	727.3563	595.1735	526.4411	336.0089	177.5612	0.0000	0.0000	0.0000	0.0000	295.8603	498.9263	717.9186	(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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-132.1063	-165.6398	-228.6902	-242.8846	-230.4389	-175.7204	-172.3155	-168.5694	-157.6396	-178.9959	-139.2198	-111.8281	(233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
(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	(235a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Annual totals kWh/year													
Space heating fuel - main system 1													3875.2462 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													190.4000
Water heating fuel used													1605.2322 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													254.8716 (232)

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

PV generation													-2104.0485 (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													3631.3015 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3875.2462	27.6700	1072.2806 (240)	
Total CO2 associated with community systems			0.0000 (473)	

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Water heating (other fuel)	1605.2322	27.6700	444.1678 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.8716	27.6700	70.5230 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2104.0485	27.6700	-582.1902
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-582.1902 (252)
Total energy cost			1004.7811 (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	3875.2462	0.1544	598.4153 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			824.6756 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2104.0485	0.1379	-290.0946
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-290.0946 (269)
Total CO2, kg/year			571.3668 (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	3875.2462	1.5717	6090.7654 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			8532.6304 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2104.0485	1.5098	-3176.6337
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3176.6337 (283)
Total Primary energy kWh/year			5746.9274 (286)

SAP 10 EPC IMPROVEMENTS

EC2401A (BASE CO2)

Current energy efficiency rating:	C 75
Current environmental impact rating:	A 95

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	+ 1.3	-£ 66	-30 kg (5.3%)
V2 Wind turbine	+ 14.6	-£ 693	-347 kg (64.1%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£66	0.25 kg/m²	C 76 A 95
Wind turbine	£693	2.89 kg/m²	B 91 A 98
Total Savings	£759	3.14 kg/m²	

Potential energy efficiency rating:	B 91
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£1587	£1496	£91
Space heating	£1072	£1096	-£23
Water heating	£444	£330	£114
Lighting	£71	£71	£0
Generated (PV)	-£582	-£558	-£24
Generated (wind)	-£0	-£693	£693
Total cost of fuels	£1005	£245	£760
Total cost of uses	£1005	£246	£760
Delivered energy	30 kWh/m²	7 kWh/m²	23 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.2 tonnes	0.4 tonnes
CO2 emissions per m²	5 kg/m²	2 kg/m²	3 kg/m²
Primary energy	48 kWh/m²	13 kWh/m²	34 kWh/m²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
Effective ac	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

3. Heat losses and heat loss parameter

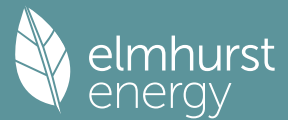
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.2500	18.8750	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.3000	10.6500	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1600	8.9600	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1600	4.9600	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.3032		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	152.8032 (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	98.1005	96.1770	94.2534	84.7621	82.9615	74.5796	74.5796	73.0274	77.8082	82.9615	86.6040	90.4063 (38)
Average = Sum(39)m / 12 =	250.9036	248.9801	247.0566	237.5652	235.7647	227.3827	227.3827	225.8305	230.6113	235.7647	239.4072	243.2095 (39)
												237.4882
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.0909	2.0748	2.0588	1.9797	1.9647	1.8949	1.8949	1.8819	1.9218	1.9647	1.9951	2.0267 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers												
	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454 (42a)
Hot water usage for baths												
	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783 (42b)
Hot water usage for other uses												
	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532 (42c)
Average daily hot water use (litres/day)												143.7856 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy conte	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Energy content (annual)	Total = Sum(45)m = 2388.2662												
Distribution loss	(46)m = 0.15 x (45)m												
	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0800 (55)
Total storage loss													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	304.4317	269.2793	284.4789	243.7482	229.5403	205.1876	201.3431	210.9942	220.3984	251.1063	269.4173	300.9645	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													638.1186 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													638.1186
Solar input	-0.0000	-16.1850	-59.1450	-81.9975	-108.0738	-99.7878	-99.1464	-86.1521	-58.8398	-28.7913	-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													
	304.4317	253.0944	225.3339	161.7507	121.4665	105.3998	102.1968	124.8421	161.5586	222.3150	269.4173	300.9645	(64)
Total per year (kWh/year) = Sum(64)m =													2352.7712 (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													
	127.7506	113.4953	120.4638	103.5603	96.8679	88.0026	87.3836	91.0276	96.4280	109.3674	115.2526	126.5978	(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	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(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)													
	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)													
	171.7078	168.8918	161.9137	143.8338	130.1987	122.2258	117.4510	122.3489	133.9278	146.9992	160.0731	170.1583	(72)
Total internal gains													
	745.7883	743.3557	719.2616	671.1527	622.6218	584.2366	561.6819	566.1964	594.8913	637.9918	685.9614	726.4589	(73)

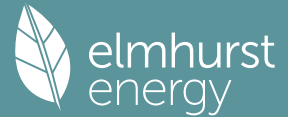
6. Solar gains

[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				1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)			
South				3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)			
North				1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)			
East				1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)			
South				2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)			
West				8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)			
North				1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)			
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	905.2243	1028.5383	1143.7689	1251.6586	1320.4405	1297.3714	1240.7886	1155.0511	1073.1922	962.6061	879.4507	861.2472 (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, n11,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.6395	29.8685	30.1011	31.3037	31.5428	32.7055	32.7055	32.9303	32.2476	31.5428	31.0628	30.5772	
alpha	2.9760	2.9912	3.0067	3.0869	3.1029	3.1804	3.1804	3.1954	3.1498	3.1029	3.0709	3.0385	
util living area	0.9918	0.9872	0.9778	0.9551	0.9058	0.8025	0.6736	0.7198	0.8830	0.9659	0.9876	0.9930	(86)
MIT	18.2926	18.5320	18.9628	19.5931	20.1628	20.6479	20.8600	20.8233	20.4553	19.7212	18.9447	18.3144	(87)
Th 2	19.2734	19.2839	19.2944	19.3469	19.3570	19.4044	19.4044	19.4132	19.3860	19.3570	19.3366	19.3156	(88)
util rest of house	0.9890	0.9828	0.9695	0.9362	0.8592	0.6919	0.4819	0.5391	0.8050	0.9477	0.9825	0.9907	(89)
MIT 2	16.9202	17.1644	17.5978	18.2492	18.7935	19.2387	19.3705	19.3639	19.0855	18.3889	17.6104	16.9688	(90)

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Living area fraction									fLA = Living area / (4) =		0.4625 (91)	
MIT	17.5549	17.7969	18.2291	18.8707	19.4268	19.8904	20.0594	20.0389	19.7190	19.0051	18.2275	17.5912 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5549	17.7969	18.2291	18.8707	19.4268	19.8904	20.0594	20.0389	19.7190	19.0051	18.2275	17.5912 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9772	0.9621	0.9289	0.8617	0.7313	0.5700	0.6205	0.8252	0.9423	0.9775	0.9870	(94)
Useful gains	891.4384	1005.0843	1100.4163	1162.7027	1137.8065	948.7691	707.2258	716.6802	885.5451	907.0549	859.6387	850.0651	(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	3325.7150	3211.0783	2897.7558	2368.6946	1821.7019	1202.9565	786.6089	821.7671	1295.8118	1981.6221	2664.0007	3256.8612	(97)
Space heating kWh	1811.1018	1482.4279	1337.2207	868.3142	508.8182	0.0000	0.0000	0.0000	0.0000	799.4780	1299.1406	1790.6563	(98a)
Space heating requirement - total per year (kWh/year)												9897.1577	
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	1811.1018	1482.4279	1337.2207	868.3142	508.8182	0.0000	0.0000	0.0000	0.0000	799.4780	1299.1406	1790.6563	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9897.1577	
Space heating per m2										(98c) / (4) =		82.4763	(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 %)													219.3000 (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	1811.1018	1482.4279	1337.2207	868.3142	508.8182	0.0000	0.0000	0.0000	0.0000	799.4780	1299.1406	1790.6563	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	825.8558	675.9817	609.7677	395.9481	232.0192	0.0000	0.0000	0.0000	0.0000	364.5590	592.4034	816.5328	(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	304.4317	253.0944	225.3339	161.7507	121.4665	105.3998	102.1968	124.8421	161.5586	222.3150	269.4173	300.9645	(64)
Efficiency of water heater													190.4000 (216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	159.8906	132.9277	118.3476	84.9531	63.7954	55.3570	53.6748	65.5683	84.8522	116.7621	141.5007	158.0696	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-117.9821	-165.5817	-229.8408	-238.5348	-227.0918	-153.2022	-151.0006	-150.1369	-145.8686	-174.4089	-127.6645	-102.3174	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4513.0678	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1235.6991	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.8716	(232)

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

PV generation													-1983.6302 (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													1597.1299 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4513.0678	16.4900	744.2049	(240)
Total CO2 associated with community systems			0.0000	(473)

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Water heating (other fuel)	1235.6991	16.4900	203.7668 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	254.8716	16.4900	42.0283 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1983.6302	16.4900	-327.1006
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-327.1006 (252)
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247
Wind Turbine electricity exported	0.0000	5.5900	0.0000
Total			-412.7247 (252)
Total energy cost			263.3667 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5746 (257)
SAP value		90.6854
SAP rating (Section 12)		91 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	4513.0678	0.1541	695.4409 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1235.6991	0.1451	179.3150 (264)
Space and water heating			874.7560 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1983.6302	0.1383	-274.4077
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-274.4077 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-347.1801 (269)
Total CO ₂ , kg/year			301.0510 (272)
CO ₂ emissions per m ²			2.5100 (273)
EI value			97.5551
EI rating			98 (274)
EI band			A

SAP 10 WORKSHEET FOR Conversion (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)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	3.9000	3.7000	3.7000	3.3000	3.4000	3.1000	3.2000	3.5000	3.4000	3.8000 (22)
Wind factor	1.0500	0.9750	0.9750	0.9250	0.9250	0.8250	0.8500	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)

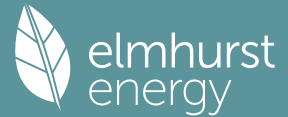
3. Heat losses and heat loss parameter

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26772.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		223.1000	(35)
Thermal bridges (Default value 0.200 * total exposed area)		60.5000	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	152.8032	(37)

Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$

4. Water heating energy requirements (kWh/year)[illegible]SAP 10 Online 3.1.57

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)	171.7078	168.8918	161.9137	143.8338	130.1987	122.2258	117.4510	122.3489	133.9278	146.9992	160.0731	170.1583	(72)
Total internal gains	745.7883	743.3557	719.2616	671.1527	622.6218	584.2366	561.6819	566.1964	594.8913	637.9918	685.9614	726.4589	(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					1.2500	12.6907		0.6300	0.7000	0.7700		4.8481 (74)	
South					3.1500	53.4173		0.6300	0.7000	0.7700		51.4238 (78)	
North					1.2500	12.6907		0.6300	0.7000	0.7700		4.8481 (74)	
East					1.4500	23.7106		0.6300	0.7000	0.7700		10.5071 (76)	
South					2.4500	53.4173		0.6300	0.7000	0.7700		39.9963 (78)	
West					8.6500	23.7106		0.6300	0.7000	0.7700		62.6803 (80)	
North					1.5000	18.5195		0.6300	0.8000	1.0000		12.6007 (82)	

Solar gains	186.9043	293.1166	436.0512	617.8060	725.5033	806.1518	750.7118	656.5570	525.4479	354.1873	223.6333	152.7020	(83)
Total gains	932.6926	1036.4722	1155.3127	1288.9587	1348.1251	1390.3883	1312.3938	1222.7534	1120.3392	992.1791	909.5947	879.1610	(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	31.7799	32.4779	32.4779	32.9303	32.9303	33.7976	33.5859	34.2094	34.0055	33.3707	33.5859	32.7055		
alpha	3.1187	3.1652	3.1652	3.1954	3.1954	3.2532	3.2391	3.2806	3.2670	3.2247	3.2391	3.1804		
util living area	0.9905	0.9863	0.9748	0.9456	0.8814	0.7380	0.5992	0.6126	0.8474	0.9556	0.9845	0.9920	(86)	
MIT	18.5853	18.7981	19.2165	19.7871	20.3383	20.7662	20.9148	20.9148	20.5935	19.9423	19.2423	18.6095	(87)	
Th 2	19.3668	19.3953	19.3953	19.4132	19.4132	19.4466	19.4385	19.4619	19.4543	19.4303	19.4385	19.4044	(88)	
util rest of house	0.9872	0.9816	0.9654	0.9230	0.8236	0.6080	0.3975	0.4054	0.7527	0.9316	0.9781	0.9892	(89)	
MIT 2	17.2714	17.5009	17.9143	18.4808	18.9905	19.3512	19.4228	19.4466	19.2475	18.6516	17.9723	17.3202	(90)	
Living area fraction									fLA = Living area / (4) =			0.4625	(91)	
MIT	17.8791	18.1009	18.5166	19.0849	19.6138	20.0056	20.1129	20.1256	19.8700	19.2485	18.5597	17.9165	(92)	
Temperature adjustment												0.0000		
adjusted MIT	17.8791	18.1009	18.5166	19.0849	19.6138	20.0056	20.1129	20.1256	19.8700	19.2485	18.5597	17.9165	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9828	0.9761	0.9583	0.9169	0.8325	0.6608	0.4921	0.5029	0.7833	0.9279	0.9729	0.9854	(94)
Useful gains	916.6336	1011.7114	1107.1624	1181.8547	1122.3172	918.7117	645.7791	614.9761	877.6123	920.6190	884.9314	866.3428	(95)
Ext temp.	4.8000	5.2000	6.9000	9.3000	12.3000	15.1000	17.0000	17.1000	14.5000	11.2000	7.7000	4.8000	(96)
Heat loss rate W	3060.5748	2953.9964	2659.9219	2209.7344	1651.6877	1079.4084	689.2588	657.7345	1174.3717	1793.6194	2404.5778	2982.4656	(97)
Space heating kWh	1595.0923	1305.2155	1155.2531	740.0733	393.8516	0.0000	0.0000	0.0000	0.0000	649.5123	1094.1454	1574.3954	(98a)
Space heating requirement - total per year (kWh/year)												8507.5390	
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	1595.0923	1305.2155	1155.2531	740.0733	393.8516	0.0000	0.0000	0.0000	0.0000	649.5123	1094.1454	1574.3954	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8507.5390	
Space heating per m2										(98c) / (4) =		70.8962	(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 %)													219.3000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	1595.0923	1305.2155	1155.2531	740.0733	393.8516	0.0000	0.0000	0.0000	0.0000	649.5123	1094.1454	1574.3954	(98)	
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)	
Space heating fuel (main heating system)	727.3563	595.1735	526.7912	337.4707	179.5949	0.0000	0.0000	0.0000	0.0000	296.1752	498.9263	717.9186	(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)	

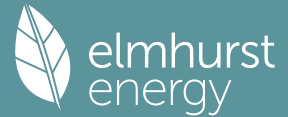
13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3879.4067	1.5716	6097.0487 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1192.9002	1.5393	1836.1782 (278)
Space and water heating			7933.2269 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)

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Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2016.1288	1.5126	-3049.5327
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3049.5327 (283)
Wind Turbine electricity used in dwelling	-2502.8785	1.5128	-3786.3546
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-3786.3546 (283)
Total Primary energy kWh/year			1609.2942 (286)

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Plot Reference	EC2401				Issued on Date	21/04/2026
Assessment Reference	EC2401B (BE LEAN)			Plot Type Ref	EC-24	
Plot Address	2 Bedroom Dwelling, Polecat Lane, Copsale, West Sussex, RH13 6QR				SAP Version	10.2
SAP Rating	77 C	DER	5.36	TER		
Environmental	95 A	% DER < TER				N/A
CO ₂ Emissions (t/year)	0.53	DFEE	84.47	TFEE		
Compliance Check	N/A	% DFEE < TFEE				
% DPER < TPER		DPER	54.10	TPER		
Assessor Details	Mr. Joe Solti				Assessor ID	5122-0001
Client	KG Designs, .					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	30.0000 / (5) =	
Pressure Test Method	No	
Measured/design AP50	Blower Door	
Infiltration rate	15.0000 (17)	
Number of sides sheltered	0.8608 (18)	
	0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	
	1.0000 (20)	
	0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)

elmhurst
energy

$$(33) + (36) + (36a) = 138.6632 \quad (37)$$
[illegible]

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)
Energy conte	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Energy content (annual)										Total =	Sum(45)m =	2388.2662

Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
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[illegible]

Output from w/h	204 4217	260 2702	205 2746	250 5010	240 3246	217 7042	214 3701	202 0006	205 0012	250 5001	260 4172	200 0645 (64)
Output from w/h	204 4217	260 2702	205 2746	250 5010	240 3246	217 7042	214 3701	202 0006	205 0012	250 5001	260 4172	200 0645 (64)

12Total per year (kWh/year)	3056 (64)
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Electric shower(s) 0 0000 0 0000 0 0000 0 0000 0 0000 0 0000 0 0000 0 0000 0 0000 0 0000 (64a)

Heat gains from water heating, kWh/month	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978 (65)
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Metabolic gains (Table 5), Watts

[illegible]

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

148.5482 164.4640 148.5482 153.4998 148.5482 153.4998 148.5482 148.5482 153.4998 148.5482 153.4998 148.5482 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

Appliances gains (calculated in Appendix L, equation L13 or L15a), also see table 5

285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288 (68)
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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

[illegible]

Losses e.g. evaporation (negative values) (Table 5)

Water heating gains (Table 5)

171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
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Total internal gains	671.4189	687.4784	658.6270	635.6244	603.2486	581.6403	559.3295	560.2672	577.2521	596.7471	633.3142	657.2850 (73)
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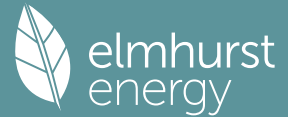
[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	

North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
South	3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)
West	8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)
North	1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)

Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883	(83)
Total gains	830.8549	972.6610	1083.1344	1216.1304	1301.0673	1294.7751	1238.4362	1149.1219	1055.5531	921.3615	826.8035	792.0732	(84)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647	
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643	
util living area	0.9937	0.9891	0.9805	0.9565	0.9030	0.7886	0.6532	0.7024	0.8792	0.9685	0.9896	0.9947 (86)	
MIT	18.3756	18.6287	19.0469	19.6828	20.2401	20.7017	20.8878	20.8550	20.5113	19.7889	19.0273	18.4040 (87)	
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947 (88)	
util rest of house	0.9915	0.9853	0.9732	0.9384	0.8569	0.6795	0.4713	0.5291	0.8023	0.9519	0.9853	0.9928 (89)	
MIT 2	17.0529	17.3113	17.7329	18.3916	18.9230	19.3454	19.4585	19.4542	19.1951	18.5101	17.7449	17.1095 (90)	
Living area fraction	fLA = Living area / (4) =												0.4625 (91)
MIT	17.6646	17.9206	18.3407	18.9888	19.5322	19.9726	20.1195	20.1021	19.8039	19.1015	18.3380	17.7082 (92)	
Temperature adjustment													0.0000
adjusted MIT	17.6646	17.9206	18.3407	18.9888	19.5322	19.9726	20.1195	20.1021	19.8039	19.1015	18.3380	17.7082 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9882	0.9805	0.9667	0.9318	0.8603	0.7197	0.5550	0.6075	0.8231	0.9470	0.9811	0.9900 (94)
Useful gains	821.0318	953.6936	1047.0390	1133.1589	1119.3336	931.8973	687.3507	698.0918	868.8001	872.5369	811.1692	784.1444 (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	3164.2622	3057.7657	2757.8875	2254.0882	1735.7998	1145.6777	750.5172	783.6926	1234.7227	1884.1439	2531.5565	3094.3148 (97)
Space heating kWh	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98a)
Space heating requirement - total per year (kWh/year)												9405.9724
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	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9405.9724
Space heating per m2											(98c) / (4) =	78.3831 (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 %)												219.3000 (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	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	794.9674	644.7499	580.4247	368.0206	209.1431	0.0000	0.0000	0.0000	0.0000	343.1991	564.8330	783.7514 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696 (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 (231)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting (232)m	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-117.3814	-164.5178	-229.5376	-240.0805	-233.9084	-169.9965	-167.7918	-163.0563	-152.1950	-173.4787	-126.7319	-101.8008 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												4289.0891 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.4000
Water heating fuel used												1605.2322 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												254.8716 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2040.4767 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4108.7163 (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	4289.0891	0.1542	661.4948 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			887.7551 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2040.4767	0.1377	-280.9604
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-280.9604 (269)
Total CO2, kg/year			643.5806 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4289.0891	1.5710	6738.1160 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			9179.9810 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2040.4767	1.5091	-3079.3110
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3079.3110 (283)
Total Primary energy kWh/year			6491.6006 (286)
Dwelling Primary energy Rate (DPER)			54.1000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

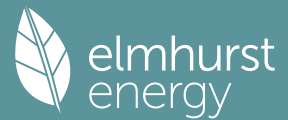
2. Ventilation rate

	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) =	0.1477 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000 (17)	
Infiltration rate		0.8977 (18)	
Number of sides sheltered		0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8977 (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	1.1445	1.1221	1.0996	0.9874	0.9650	0.8528	0.8528	0.8303	0.8977	0.9650	1.0099	1.0548 (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	1.1445	1.1221	1.0996	0.9875	0.9656	0.8636	0.8636	0.8447	0.9029	0.9656	1.0099	1.0548 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
Front Door			2.1000	3.0000	6.3000			(26)					
Windows (existing)			4.4000	1.6791	7.3881			(27)					
Windows (new)			13.8000	1.3258	18.2955			(27)					
Roof Windows			1.5000	1.3258	1.9886			(27a)					
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000	(28a)					
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000	(29a)					
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000	(29a)					
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000	(30)					
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000	(30)					
Total net area of external elements Aum(A, m2)			302.5000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632			(33)					
Main dwelling													
Internal Wall			50.0000			9.0000	450.0000	(32c)					
Internal Floor			44.5000			18.0000	801.0000	(32d)					
Internal Ceiling			44.5000			9.0000	400.5000	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000	(35)					
Thermal bridges (Default value 0.200 * total exposed area)							60.5000	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	138.6632	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 102.3080	Feb 100.3020	Mar 98.2959	Apr 88.2728	May 86.3144	Jun 77.1981	Jul 77.1981	Aug 75.5099	Sep 80.7096	Oct 86.3144	Nov 90.2718	Dec 94.2838	(38)
Heat transfer coeff	240.9711	238.9651	236.9591	226.9359	224.9776	215.8612	215.8612	214.1730	219.3727	224.9776	228.9349	232.9470	(39)
Average = Sum(39)m / 12 =												226.7447	
HLP	Jan 2.0081	Feb 1.9914	Mar 1.9747	Apr 1.8911	May 1.8748	Jun 1.7988	Jul 1.7988	Aug 1.7848	Sep 1.8281	Oct 1.8748	Nov 1.9078	Dec 1.9412	(40)
HLP (average)												1.8895	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8633	(42)
Hot water usage for mixer showers														(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
Hot water usage for baths														(42b)
31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783			
Hot water usage for other uses														(42c)
43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532			
Average daily hot water use (litres/day)													68.8697	(43)
Daily hot water use	Jan 75.1369	Feb 73.0755	Mar 70.8250	Apr 68.0242	May 65.5255	Jun 62.9288	Jul 62.3895	Aug 64.6354	Sep 66.9389	Oct 69.6055	Nov 72.4310	Dec 75.0315	(44)	
Energy conte	118.9985	104.0585	108.8554	93.1218	88.2100	77.3783	75.4547	80.0322	82.5423	94.4540	103.1913	117.4812	(45)	
Energy content (annual)										Total = Sum(45)m =		1143.7782		
Distribution loss (46)m = 0.15 x (45)m													(46)	
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		
Water storage loss (or HIU loss):													(46)	
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage													(57)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														
101.1487	88.4497	92.5271	79.1535	74.9785	65.7716	64.1365	68.0273	70.1610	80.2859	87.7126	99.8590		(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	101.1487	88.4497	92.5271	79.1535	74.9785	65.7716	64.1365	68.0273	70.1610	80.2859	87.7126	99.8590	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		972.2114	(64)	
Electric shower(s)	57.8427	51.5384	56.2779	53.7053	54.7131	52.1910	53.9307	54.7131	53.7053	56.2779	55.2197	57.8427	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												657.9578	(64a)	
Heat gains from water heating, kWh/month	39.7479	34.9970	37.2013	33.2147	32.4229	29.4906	29.5168	30.6851	30.9666	34.1410	35.7331	39.4254	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	Jan 143.1657	Feb 143.1657	Mar 143.1657	Apr 143.1657	May 143.1657	Jun 143.1657	Jul 143.1657	Aug 143.1657	Sep 143.1657	Oct 143.1657	Nov 143.1657	Dec 143.1657	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
148.5482	164.4640	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288		(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	(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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)	
Water heating gains (Table 5)	53.4246	52.0789	50.0017	46.1315	43.5791	40.9592	39.6731	41.2434	43.0091	45.8884	49.6293	52.9912	(72)	
Total internal gains	553.1356	570.6655	545.2142	530.4182	502.8717	486.3662	467.5441	466.1548	480.3303	494.1354	522.8704	540.1179	(73)	

6. Solar gains

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[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
South	3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)
West	8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)
North	1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)

Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	712.5716	855.8481	969.7216	1110.9241	1200.6904	1199.5010	1146.6508	1055.0095	958.6312	818.7498	716.3597	674.9061 (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	30.8612	31.1203	31.3838	32.7699	33.0551	34.4511	34.4511	34.7227	33.8997	33.0551	32.4838	31.9243
util living area	3.0574	3.0747	3.0923	3.1847	3.2037	3.2967	3.2967	3.3148	3.2600	3.2037	3.1656	3.1283
util living area	0.9959	0.9923	0.9856	0.9659	0.9204	0.8183	0.6906	0.7413	0.9035	0.9772	0.9931	0.9966 (86)
MIT	18.2359	18.4928	18.9199	19.5766	20.1577	20.6541	20.8634	20.8239	20.4430	19.6863	18.9038	18.2663 (87)
Th 2	19.3279	19.3391	19.3503	19.4069	19.4181	19.4708	19.4708	19.4807	19.4504	19.4181	19.3955	19.3728 (88)
util rest of house	0.9944	0.9896	0.9800	0.9511	0.8799	0.7144	0.5053	0.5684	0.8361	0.9647	0.9902	0.9954 (89)
MIT 2	16.8990	17.1618	17.5935	18.2772	18.8380	19.3027	19.4359	19.4286	19.1302	18.3993	17.6092	16.9582 (90)
Living area fraction	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (92)
MIT	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (92)
Temperature adjustment	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (93)
adjusted MIT	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9920	0.9858	0.9744	0.9444	0.8809	0.7509	0.5903	0.6459	0.8520	0.9599	0.9869	0.9934 (94)
Ext temp.	706.8744	843.7024	944.9330	1049.1990	1057.6763	900.6590	676.8140	681.4676	816.7131	785.8962	706.9861	670.4705 (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	3184.9967	3077.2488	2774.0785	2264.4043	1743.2011	1150.0473	754.6855	786.8576	1236.6777	1888.5801	2543.0033	3112.9151 (97)
Space heating requirement - total per year (kWh/year)	1843.7230	1500.9432	1360.8842	874.9478	510.0305	0.0000	0.0000	0.0000	0.0000	820.3968	1321.9324	1817.1788 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1843.7230	1500.9432	1360.8842	874.9478	510.0305	0.0000	0.0000	0.0000	0.0000	820.3968	1321.9324	1817.1788 (98c)
Space heating per m2	(98c) / (4) =											83.7503 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5849	0.6702	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1186.7847	1070.5882	1020.0704	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1319.2419	1261.8808	1162.0020	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	95.3692	142.3217	105.5971	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (108)
Energy for space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (109)
Total	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (110)
Fabric Energy Efficiency (DFEE)	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (111)

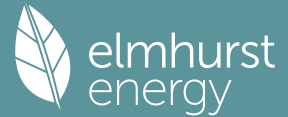
SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)

CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	75.5000 (1b)	x	2.3500 (2b)
First floor	44.5000 (1c)	x	2.1000 (2c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		93.4500 (1c) - (3c)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	270.8750 (5)

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2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												3 * 10 = 30.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											30.0000 / (5) = 0.1108 (8)
Pressure test												No
Pressure Test Method												Blower Door
Measured/design AP50												15.0000 (17)
Infiltration rate												0.8608 (18)
Number of sides sheltered												0 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

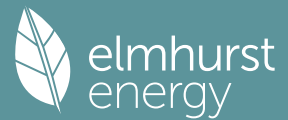
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1000	3.0000	6.3000			(26)
Windows (existing)			4.4000	1.6791	7.3881			(27)
Windows (new)			13.8000	1.3258	18.2955			(27)
Roof Windows			1.5000	1.3258	1.9886			(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000	(28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000	(29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000	(29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000	(30)
Total net area of external elements Aum(A, m2)			302.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632			(33)
Main dwelling								
Internal Wall			50.0000			9.0000	450.0000	(32c)
Internal Floor			44.5000			18.0000	801.0000	(32d)
Internal Ceiling			44.5000			9.0000	400.5000	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		26772.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		138.6632	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454 (42a)
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783 (42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532 (42c)
Average daily hot water use (litres/day)												143.7856 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2388.2662
	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333 (46)
Water storage loss (or HIU loss):												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

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Total heat required for water heating calculated for each month												
	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Total per year (kWh/year) = Sum(64)m =												3056.3622 (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	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978 (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	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432 (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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
Total internal gains	745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589 (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					1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)		
South					3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)		
North					1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)		
East					1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)		
South					2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)		
West					8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)		
North					1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)		
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	905.2243	1028.5383	1145.2697	1259.1626	1334.1978	1311.3788	1254.7961	1168.0580	1079.1954	964.1069	879.4507	861.2472 (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	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643
util living area	0.9919	0.9873	0.9773	0.9524	0.8975	0.7839	0.6475	0.6954	0.8734	0.9645	0.9876	0.9932 (86)
MIT	18.4363	18.6736	19.0953	19.7137	20.2594	20.7077	20.8908	20.8595	20.5239	19.8210	19.0702	18.4613 (87)
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947 (88)
util rest of house	0.9892	0.9829	0.9690	0.9330	0.8495	0.6740	0.4660	0.5221	0.7944	0.9461	0.9826	0.9909 (89)
MIT 2	17.1130	17.3556	17.7799	18.4203	18.9389	19.3489	19.4594	19.4558	19.2041	18.5402	17.7871	17.1663 (90)
Living area fraction	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (91)
MIT	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (92)
Temperature adjustment	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (93)
adjusted MIT	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (93)

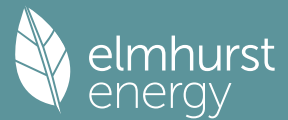
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9852	0.9776	0.9620	0.9264	0.8538	0.7148	0.5495	0.6006	0.8163	0.9412	0.9778	0.9875 (94)
Useful gains	891.8568	1005.4692	1101.7118	1166.5286	1139.0961	937.3574	689.5638	701.5593	880.9327	907.4610	859.9615	850.4606 (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	3178.5572	3068.2269	2768.9735	2260.7296	1739.6805	1146.6728	750.9188	784.3153	1237.0292	1891.0279	2541.1371	3107.3824 (97)
Space heating kWh	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98a)
Space heating requirement - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
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)	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating per m ²	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98c)
(98c) / (4) =												76.5329 (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)

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Efficiency of main space heating system 1 (in %)													219.3000	(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	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498	(98)	
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)	
Space heating fuel (main heating system)	775.7889	632.0899	565.6373	359.2452	203.7550	0.0000	0.0000	0.0000	0.0000	333.6862	551.9592	765.6862	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)	
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)	
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696	(219)	
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-117.0669	-164.0403	-228.4939	-238.9629	-232.8458	-169.9965	-167.7918	-163.0563	-152.1950	-172.7474	-126.3699	-101.5579	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													4187.8480	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													190.4000	
Water heating fuel used													1605.2322	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													254.8716	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2035.1246	(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													4012.8272	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4187.8480	16.4900	690.5761	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1605.2322	16.4900	264.7028	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	254.8716	16.4900	42.0283	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2035.1246	16.4900	-335.5921	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-335.5921	(252)
Total energy cost			661.7152	(255)

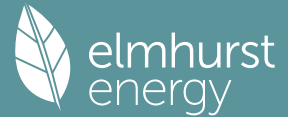
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		1.4437	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	76.5969	
SAP rating (Section 12)		77	(258)
SAP band		C	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4187.8480	0.1542	645.9322	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1605.2322	0.1410	226.2603	(264)
Space and water heating			872.1925	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)

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Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2035.1246	0.1377	-280.1793
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-280.1793 (269)
Total CO ₂ , kg/year			628.7991 (272)
CO ₂ emissions per m ²			5.2400 (273)
EI value			94.8934
EI rating			95 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	3.9000	3.7000	3.7000	3.3000	3.4000	3.1000	3.2000	3.5000	3.4000	3.8000 (22)
Wind factor	1.0500	0.9750	0.9750	0.9250	0.9250	0.8250	0.8500	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)
Adj infilt rate	0.9038	0.8392	0.8392	0.7962	0.7962	0.7101	0.7316	0.6671	0.6886	0.7532	0.7316	0.8177 (22b)
Effective ac	0.9084	0.8522	0.8522	0.8170	0.8170	0.7521	0.7676	0.7225	0.7371	0.7836	0.7676	0.8343 (25)

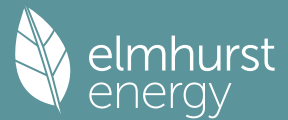
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		60.5000 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	138.6632 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 81.2023	Feb 76.1732	Mar 76.1732	Apr 73.0274	May 73.0274	Jun 67.2325	Jul 68.6191	Aug 64.5834	Sep 65.8872	Oct 70.0471	Nov 68.6191	Dec 74.5796 (38)
Heat transfer coeff	219.8655	214.8363	214.8363	211.6905	211.6905	205.8956	207.2823	203.2465	204.5504	208.7103	207.2823	213.2427 (39)
Average = Sum(39)m / 12 =												210.2608
HLP	Jan 1.8322	Feb 1.7903	Mar 1.7903	Apr 1.7641	May 1.7641	Jun 1.7158	Jul 1.7274	Aug 1.6937	Sep 1.7046	Oct 1.7393	Nov 1.7274	Dec 1.7770 (40)

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	1.7522
Days in month												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers												
81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454	(42a)
Hot water usage for baths												
31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses												
43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)												143.7856 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy content (annual)												
247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Distribution loss (46)m = 0.15 x (45)m												
37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss												
33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage												
33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss												
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(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												
304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(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												
127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(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)												
-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)												
171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583	(72)
Total internal gains												
745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589	(73)

6. Solar gains												

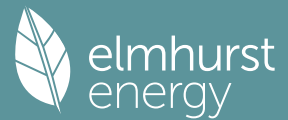
[Jan]												
			Area	Solar flux	g	FF		Access				Gains
			m2	Table 6a	Specific data	Specific data		factor				W
				W/m2	or Table 6b	or Table 6c		Table 6d				
North			1.2500	12.6907	0.6300	0.7000		0.7700				4.8481 (74)
South			3.1500	53.4173	0.6300	0.7000		0.7700				51.4238 (78)
North			1.2500	12.6907	0.6300	0.7000		0.7700				4.8481 (74)
East			1.4500	23.7106	0.6300	0.7000		0.7700				10.5071 (76)
South			2.4500	53.4173	0.6300	0.7000		0.7700				39.9963 (78)
West			8.6500	23.7106	0.6300	0.7000		0.7700				62.6803 (80)
North			1.5000	18.5195	0.6300	0.8000		1.0000				12.6007 (82)

Solar gains	186.9043	293.1166	436.0512	617.8060	725.5033	806.1518	750.7118	656.5570	525.4479	354.1873	223.6333	152.7020 (83)
Total gains	932.6926	1036.4722	1156.8135	1296.4627	1361.8824	1404.3958	1326.4012	1235.7603	1126.3424	993.6799	909.5947	879.1610 (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	
33.8237	34.6155	34.6155	35.1299	35.1299	36.1186	35.8770	36.5894	36.3562	35.6315	35.8770	34.8742	
alpha	3.2549	3.3077	3.3077	3.3420	3.3420	3.4079	3.3918	3.4393	3.4237	3.3754	3.3918	3.3249
util living area												
0.9905	0.9862	0.9740	0.9417	0.8699	0.7142	0.5706	0.5834	0.8334	0.9530	0.9843	0.9921	(86)
MIT												
18.7324	18.9457	19.3525	19.9074	20.4284	20.8141	20.9366	20.9368	20.6563	20.0402	19.3698	18.7585	(87)
Th 2												
19.4475	19.4768	19.4768	19.4952	19.4952	19.5295	19.5213	19.5453	19.5375	19.5128	19.5213	19.4861	(88)
util rest of house												
0.9874	0.9815	0.9645	0.9184	0.8107	0.5880	0.3837	0.3915	0.7384	0.9287	0.9779	0.9894	(89)

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MIT 2	17.4708	17.7017	18.1032	18.6534	19.1307	19.4538	19.5093	19.5337	19.3628	18.8031	18.1544	17.5228 (90)
Living area fraction									FLA = Living area / (4) =			0.4625 (91)
MIT	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	18.0943 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	18.0943 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9764	0.9578	0.9132	0.8218	0.6404	0.4711	0.4816	0.7707	0.9257	0.9730	0.9858	(94)
Useful gains	917.0184	1011.9721	1108.0083	1183.9326	1119.1361	899.4313	624.9121	595.1286	868.1079	919.8370	885.0480	866.7171	(95)
Ext temp.	4.8000	5.2000	6.9000	9.3000	12.3000	15.1000	17.0000	17.1000	14.5000	11.2000	7.7000	4.8000	(96)
Heat loss rate W	2914.1565	2809.4212	2530.9869	2102.8019	1573.0475	1025.9686	656.9717	626.5395	1117.0532	1706.2618	2283.5367	2834.9196	(97)
Space heating kWh	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426	(98a)
Space heating requirement - total per year (kWh/year)												7808.1032	
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	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7808.1032	
Space heating per m2										(98c) / (4) =		65.0675	(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 %)													219.3000 (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	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	677.5516	550.7915	482.7616	301.6808	153.9946	0.0000	0.0000	0.0000	0.0000	266.8035	459.1481	667.7349	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-131.0087	-163.7761	-225.2798	-237.9734	-225.3506	-175.7204	-172.3155	-168.5694	-157.6396	-176.3103	-137.7303	-110.9574	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3560.4666	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1605.2322	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.8716	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2082.6314	(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												3337.9390	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3560.4666	27.6700	985.1811 (240)
Total CO2 associated with community systems			0.0000 (473)

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Water heating (other fuel)	1605.2322	27.6700	444.1678 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.8716	27.6700	70.5230 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2082.6314	27.6700	-576.2641
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-576.2641 (252)
Total energy cost			923.6077 (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	3560.4666	0.1546	550.3551 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			776.6154 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2082.6314	0.1378	-286.9897
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-286.9897 (269)
Total CO2, kg/year			526.4116 (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	3560.4666	1.5723	5598.0522 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			8039.9173 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2082.6314	1.5095	-3143.7219
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3143.7219 (283)
Total Primary energy kWh/year			5287.1260 (286)

SAP 10 EPC IMPROVEMENTS

EC2401B (BE LEAN)

Current energy efficiency rating:	C 77
Current environmental impact rating:	A 95

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	+ 1.2	-£ 66	-30 kg (5.7%)
V2 Wind turbine	+ 14.6	-£ 693	-347 kg (69.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£66	0.25 kg/m²	C 78 A 95
Wind turbine	£693	2.89 kg/m²	A 92 A 98
Total Savings	£759	3.14 kg/m²	

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

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£1500	£1409	£91
Space heating	£985	£1008	-£23
Water heating	£444	£330	£114
Lighting	£71	£71	£0
Generated (PV)	-£576	-£552	-£25
Generated (wind)	-£0	-£693	£693
Total cost of fuels	£924	£164	£759
Total cost of uses	£924	£164	£759
Delivered energy	28 kWh/m²	5 kWh/m²	23 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.1 tonnes	0.4 tonnes
CO2 emissions per m²	4 kg/m²	1 kg/m²	3 kg/m²
Primary energy	44 kWh/m²	10 kWh/m²	34 kWh/m²

Full SAP Calculation Printout



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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
Effective ac	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

3. Heat losses and heat loss parameter

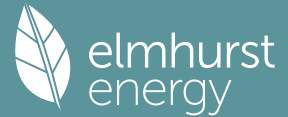
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	138.6632 (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	98.1005	96.1770	94.2534	84.7621	82.9615	74.5796	74.5796	73.0274	77.8082	82.9615	86.6040	90.4063 (38)
Average = Sum(39)m / 12 =	236.7636	234.8401	232.9166	223.4252	221.6247	213.2427	213.2427	211.6905	216.4713	221.6247	225.2672	229.0695 (39)
												223.3482
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.9730	1.9570	1.9410	1.8619	1.8469	1.7770	1.7770	1.7641	1.8039	1.8469	1.8772	1.9089 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers												
Hot water usage for baths	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454 (42a)
Hot water usage for other uses	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783 (42b)
Average daily hot water use (litres/day)	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532 (42c)
												143.7856 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy conte	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Energy content (annual)	Total = Sum(45)m = 2388.2662												
Distribution loss	(46)m = 0.15 x (45)m												
	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0800 (55)
Total storage loss													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	304.4317	269.2793	284.4789	243.7482	229.5403	205.1876	201.3431	210.9942	220.3984	251.1063	269.4173	300.9645	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													638.1186 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													638.1186
Solar input	-0.0000	-16.1850	-59.1450	-81.9975	-108.0738	-99.7878	-99.1464	-86.1521	-58.8398	-28.7913	-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													
	304.4317	253.0944	225.3339	161.7507	121.4665	105.3998	102.1968	124.8421	161.5586	222.3150	269.4173	300.9645	(64)
Total per year (kWh/year) = Sum(64)m =													2352.7712 (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													
	127.7506	113.4953	120.4638	103.5603	96.8679	88.0026	87.3836	91.0276	96.4280	109.3674	115.2526	126.5978	(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	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(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)													
	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)													
	171.7078	168.8918	161.9137	143.8338	130.1987	122.2258	117.4510	122.3489	133.9278	146.9992	160.0731	170.1583	(72)
Total internal gains													
	745.7883	743.3557	719.2616	671.1527	622.6218	584.2366	561.6819	566.1964	594.8913	637.9918	685.9614	726.4589	(73)

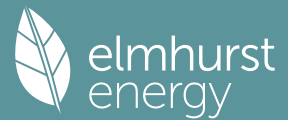
6. Solar gains

[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				1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)			
South				3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)			
North				1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)			
East				1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)			
South				2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)			
West				8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)			
North				1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)			
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	905.2243	1028.5383	1143.7689	1251.6586	1320.4405	1297.3714	1240.7886	1155.0511	1073.1922	962.6061	879.4507	861.2472 (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	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647	
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643	
util living area	0.9919	0.9873	0.9774	0.9532	0.8998	0.7879	0.6524	0.7002	0.8748	0.9646	0.9876	0.9932	(86)
MIT	18.4363	18.6736	19.0941	19.7083	20.2515	20.7026	20.8882	20.8564	20.5207	19.8199	19.0702	18.4613	(87)
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947	(88)
util rest of house	0.9892	0.9829	0.9691	0.9340	0.8526	0.6786	0.4705	0.5269	0.7964	0.9463	0.9826	0.9909	(89)
MIT 2	17.1130	17.3556	17.7788	18.4154	18.9324	19.3459	19.4586	19.4547	19.2019	18.5391	17.7871	17.1663	(90)

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Living area fraction									fLA = Living area / (4) =	0.4625 (91)		
MIT	17.7250	17.9652	18.3871	19.0134	19.5425	19.9734	20.1198	20.1030	19.8118	19.1315	18.3805	17.7652 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7250	17.9652	18.3871	19.0134	19.5425	19.9734	20.1198	20.1030	19.8118	19.1315	18.3805	17.7652 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9776	0.9621	0.9274	0.8565	0.7190	0.5542	0.6053	0.8180	0.9415	0.9778	0.9875	(94)
Useful gains	891.8568	1005.4692	1100.4019	1160.7549	1130.9487	932.7593	687.6736	699.1921	877.8829	906.2469	859.9615	850.4606	(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	3178.5572	3068.2269	2768.7076	2259.5801	1738.0813	1145.8349	750.5758	783.8902	1236.4498	1890.7884	2541.1371	3107.3824	(97)
Space heating kWh	1701.3051	1386.1732	1241.2194	791.1542	451.7067	0.0000	0.0000	0.0000	0.0000	732.4989	1210.4465	1679.1498	(98a)
Space heating requirement - total per year (kWh/year)												9193.6538	
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	1701.3051	1386.1732	1241.2194	791.1542	451.7067	0.0000	0.0000	0.0000	0.0000	732.4989	1210.4465	1679.1498	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9193.6538	
Space heating per m2										(98c) / (4) =		76.6138	(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 %)													219.3000 (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	1701.3051	1386.1732	1241.2194	791.1542	451.7067	0.0000	0.0000	0.0000	0.0000	732.4989	1210.4465	1679.1498	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	775.7889	632.0899	565.9915	360.7634	205.9766	0.0000	0.0000	0.0000	0.0000	334.0168	551.9592	765.6862	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	304.4317	253.0944	225.3339	161.7507	121.4665	105.3998	102.1968	124.8421	161.5586	222.3150	269.4173	300.9645	(64)
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)
Fuel for water heating, kWh/month	159.8906	132.9277	118.3476	84.9531	63.7954	55.3570	53.6748	65.5683	84.8522	116.7621	141.5007	158.0696	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-117.1790	-163.9504	-226.7160	-233.8984	-221.5876	-153.2022	-151.0006	-150.1369	-145.8686	-172.0671	-126.5555	-101.6498	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	-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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4192.2726	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1235.6991	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.8716	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1963.8121	(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												1296.1528	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4192.2726	16.4900	691.3057 (240)
Total CO2 associated with community systems			0.0000 (473)

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Water heating (other fuel)	1235.6991	16.4900	203.7668 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	254.8716	16.4900	42.0283 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1963.8121	16.4900	-323.8326
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-323.8326 (252)
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247
Wind Turbine electricity exported	0.0000	5.5900	0.0000
Total			-412.7247 (252)
Total energy cost			213.7356 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4663 (257)
SAP value		92.4408
SAP rating (Section 12)		92 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	4192.2726	0.1542	646.5417 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1235.6991	0.1451	179.3150 (264)
Space and water heating			825.8568 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1963.8121	0.1383	-271.5534
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-271.5534 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-347.1801 (269)
Total CO ₂ , kg/year			255.0061 (272)
CO ₂ emissions per m ²			2.1300 (273)
EI value			97.9290
EI rating			98 (274)
EI band			A

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

1. Overall dwelling characteristics

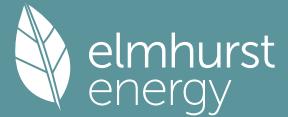
	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	3.9000	3.7000	3.7000	3.3000	3.4000	3.1000	3.2000	3.5000	3.4000	3.8000 (22)
Wind factor	1.0500	0.9750	0.9750	0.9250	0.9250	0.8250	0.8500	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)

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Adj infilt rate	0.9038	0.8392	0.8392	0.7962	0.7962	0.7101	0.7316	0.6671	0.6886	0.7532	0.7316	0.8177 (22b)
Effective ac	0.9084	0.8522	0.8522	0.8170	0.8170	0.7521	0.7676	0.7225	0.7371	0.7836	0.7676	0.8343 (25)

3. Heat losses and heat loss parameter

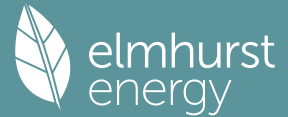
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1000	3.0000	6.3000			(26)
Windows (existing)			4.4000	1.6791	7.3881			(27)
Windows (new)			13.8000	1.3258	18.2955			(27)
Roof Windows			1.5000	1.3258	1.9886			(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000	(28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000	(29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000	(29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000	(30)
Total net area of external elements Aum(A, m2)			302.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.1632			(33)
Main dwelling								
Internal Wall			50.0000			9.0000	450.0000	(32c)
Internal Floor			44.5000			18.0000	801.0000	(32d)
Internal Ceiling			44.5000			9.0000	400.5000	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	138.6632	(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	81.2567	76.1732	76.1732	73.0274	73.0274	67.2325	68.6191	64.5834	65.8872	70.0471	68.6191	74.5796	(38)
Average = Sum(39)m / 12 =	219.8655	214.8363	214.8363	211.6905	211.6905	205.8956	207.2823	203.2465	204.5504	208.7103	207.2823	213.2427	(39)
												210.2608	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.8322	1.7903	1.7903	1.7641	1.7641	1.7158	1.7274	1.6937	1.7046	1.7393	1.7274	1.7770	(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													2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454	(42a)
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)													143.7856 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Distribution loss (46)m = 0.15 x (45)m	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	304.4317	269.2793	284.4789	243.7482	229.5403	205.1876	201.3431	210.9942	220.3984	251.1063	269.4173	300.9645	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													719.6078 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													719.6078
Solar input	-0.0000	-18.6201	-62.7631	-89.5694	-113.3796	-114.6179	-111.1346	-99.2782	-68.7819	-36.9069	-4.5559	-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	304.4317	250.6592	221.7158	154.1788	116.1607	90.5697	90.2085	111.7160	151.6165	214.1994	264.8613	300.9645	(64)
													2271.2820 (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	127.7506	113.4953	120.4638	103.5603	96.8679	88.0026	87.3836	91.0276	96.4280	109.3674	115.2526	126.5978	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)	171.7078	168.8918	161.9137	143.8338	130.1987	122.2258	117.4510	122.3489	133.9278	146.9992	160.0731	170.1583	(72)
Total internal gains	745.7883	743.3557	719.2616	671.1527	622.6218	584.2366	561.6819	566.1964	594.8913	637.9918	685.9614	726.4589	(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					1.2500	12.6907		0.6300		0.7000		0.7700		4.8481 (74)	
South					3.1500	53.4173		0.6300		0.7000		0.7700		51.4238 (78)	
North					1.2500	12.6907		0.6300		0.7000		0.7700		4.8481 (74)	
East					1.4500	23.7106		0.6300		0.7000		0.7700		10.5071 (76)	
South					2.4500	53.4173		0.6300		0.7000		0.7700		39.9963 (78)	
West					8.6500	23.7106		0.6300		0.7000		0.7700		62.6803 (80)	
North					1.5000	18.5195		0.6300		0.8000		1.0000		12.6007 (82)	

Solar gains	186.9043	293.1166	436.0512	617.8060	725.5033	806.1518	750.7118	656.5570	525.4479	354.1873	223.6333	152.7020	(83)		
Total gains	932.6926	1036.4722	1155.3127	1288.9587	1348.1251	1390.3883	1312.3938	1222.7534	1120.3392	992.1791	909.5947	879.1610	(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	33.8237	34.6155	34.6155	35.1299	35.1299	36.1186	35.8770	36.5894	36.3562	35.6315	35.8770	34.8742
alpha	3.2549	3.3077	3.3077	3.3420	3.3420	3.4079	3.3918	3.4393	3.4237	3.3754	3.3918	3.3249
util living area	0.9905	0.9862	0.9741	0.9426	0.8727	0.7184	0.5752	0.5881	0.8351	0.9532	0.9843	0.9921 (86)
MIT	18.7324	18.9457	19.3513	19.9022	20.4212	20.8105	20.9350	20.9352	20.6536	20.0391	19.3698	18.7585 (87)
Th 2	19.4475	19.4768	19.4768	19.4952	19.4952	19.5295	19.5213	19.5453	19.5375	19.5128	19.5213	19.4861 (88)
util rest of house	0.9874	0.9815	0.9646	0.9195	0.8143	0.5924	0.3875	0.3954	0.7405	0.9289	0.9779	0.9894 (89)
MIT 2	17.4708	17.7017	18.1021	18.6487	19.1251	19.4520	19.5090	19.5334	19.3610	18.8021	18.1544	17.5228 (90)
Living area fraction	18.0543	18.2770	18.6799	19.2284	19.7246	20.0803	20.1685	20.1817	19.9588	19.3742	18.7166	18.0943 (92)
MIT	18.0543	18.2770	18.6799	19.2284	19.7246	20.0803	20.1685	20.1817	19.9588	19.3742	18.7166	18.0943 (93)
Temperature adjustment												0.0000
adjusted MIT	18.0543	18.2770	18.6799	19.2284	19.7246	20.0803	20.1685	20.1817	19.9588	19.3742	18.7166	18.0943 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9764	0.9579	0.9143	0.8249	0.6447	0.4754	0.4859	0.7727	0.9259	0.9730	0.9858	(94)
Useful gains	917.0184	1011.9721	1106.7239	1178.4624	1112.0203	896.3311	623.8502	594.0870	865.6356	918.6960	885.0480	866.7171	(95)
Ext temp.	4.8000	5.2000	6.9000	9.3000	12.3000	15.1000	17.0000	17.1000	14.5000	11.2000	7.7000	4.8000	(96)
Heat loss rate W	2914.1565	2809.4212	2530.7399	2101.7534	1571.7098	1025.4277	656.7774	626.3504	1116.6092	1706.0458	2283.5367	2834.9196	(97)
Space heating kWh	1485.8707	1207.8858	1059.4679	664.7695	342.0089	0.0000	0.0000	0.0000	0.0000	585.7883	1006.9119	1464.3426	(98a)
Space heating requirement - total per year (kWh/year)												7817.0457	
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	1485.8707	1207.8858	1059.4679	664.7695	342.0089	0.0000	0.0000	0.0000	0.0000	585.7883	1006.9119	1464.3426	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7817.0457	
Space heating per m ²										(98c) / (4) =		65.1420	(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 %)												219.3000 (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	1485.8707	1207.8858	1059.4679	664.7695	342.0089	0.0000	0.0000	0.0000	0.0000	585.7883	1006.9119	1464.3426	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	677.5516	550.7915	483.1135	303.1325	155.9548	0.0000	0.0000	0.0000	0.0000	267.1173	459.1481	667.7349	(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)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	3564.5443	1.5722	5604.2121 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1192.9002	1.5393	1836.1782 (278)
Space and water heating			7440.3903 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)

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Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1993.7384	1.5123	-3015.1524
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3015.1524 (283)
Wind Turbine electricity used in dwelling	-2502.8785	1.5128	-3786.3546
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-3786.3546 (283)
Total Primary energy kWh/year			1150.8379 (286)

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Plot Reference	EC2401			Issued on Date	21/04/2026
Assessment Reference	EC2401C (BE CLEAN)	Plot Type Ref	EC-24		
Plot Address	2 Bedroom Dwelling, Polecat Lane, Copsale, West Sussex, RH13 6QR			SAP Version	10.2
SAP Rating	65 D	DER	7.70	TER	
Environmental	93 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.81	DFEE	84.47	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	79.76	TPER	
Assessor Details	Mr. Joe Solti			Assessor ID	5122-0001
Client	KG Designs, .				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
Effective ac	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements A _{um} (A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)

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Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 0.0000
138.6632 (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	98.1005	96.1770	94.2534	84.7621	82.9615	74.5796	74.5796	73.0274	77.8082	82.9615	86.6040	90.4063	(38)
Heat transfer coeff	236.7636	234.8401	232.9166	223.4252	221.6247	213.2427	213.2427	211.6905	216.4713	221.6247	225.2672	229.0695	(39)
Average = Sum(39)m / 12 =												223.3482	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.9730	1.9570	1.9410	1.8619	1.8469	1.7770	1.7770	1.7641	1.8039	1.8469	1.8772	1.9089	(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													2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454	(42a)
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)												143.7856	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Distribution loss (46)m = 0.15 x (45)m	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)
12Total per year (kWh/year)												3056.3622	(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	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978	(65)

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

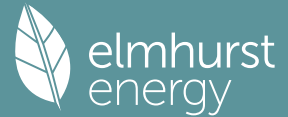
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.5482	164.4640	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	153.4998	148.5482	153.4998	148.5482	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	(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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583	(72)
Total internal gains	671.4189	687.4784	658.6270	635.6244	603.2486	581.6403	559.3295	560.2672	577.2521	596.7471	633.3142	657.2850	(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					1.2500	10.6334	0.6300	0.7000			0.7700			4.0621 (74)
South					3.1500	46.7521	0.6300	0.7000			0.7700			45.0073 (78)
North					1.2500	10.6334	0.6300	0.7000			0.7700			4.0621 (74)
East					1.4500	19.6403	0.6300	0.7000			0.7700			8.7034 (76)
South					2.4500	46.7521	0.6300	0.7000			0.7700			35.0057 (78)
West					8.6500	19.6403	0.6300	0.7000			0.7700			51.9201 (80)
North					1.5000	15.6897	0.6300	0.8000			1.0000			10.6753 (82)
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883	(83)	
Total gains	830.8549	972.6610	1083.1344	1216.1304	1301.0673	1294.7751	1238.4362	1149.1219	1055.5531	921.3615	826.8035	792.0732	(84)	

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643
util living area	0.9937	0.9891	0.9805	0.9565	0.9030	0.7886	0.6532	0.7024	0.8792	0.9685	0.9896	0.9947 (86)
MIT	18.3756	18.6287	19.0469	19.6828	20.2401	20.7017	20.8878	20.8550	20.5113	19.7889	19.0273	18.4040 (87)
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947 (88)
util rest of house	0.9915	0.9853	0.9732	0.9384	0.8569	0.6795	0.4713	0.5291	0.8023	0.9519	0.9853	0.9928 (89)
MIT 2	17.0529	17.3113	17.7329	18.3916	18.9230	19.3454	19.4585	19.4542	19.1951	18.5101	17.7449	17.1095 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.6646	17.9206	18.3407	18.9888	19.5322	19.9726	20.1195	20.1021	19.8039	19.1015	18.3380	17.7082 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.6646	17.9206	18.3407	18.9888	19.5322	19.9726	20.1195	20.1021	19.8039	19.1015	18.3380	17.7082 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9882	0.9805	0.9667	0.9318	0.8603	0.7197	0.5550	0.6075	0.8231	0.9470	0.9811	0.9900 (94)
Useful gains	821.0318	953.6936	1047.0390	1133.1589	1119.3336	931.8973	687.3507	698.0918	868.8001	872.5369	811.1692	784.1444 (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	3164.2622	3057.7657	2757.8875	2254.0882	1735.7998	1145.6777	750.5172	783.6926	1234.7227	1884.1439	2531.5565	3094.3148 (97)
Space heating kWh	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98a)
Space heating requirement - total per year (kWh/year)												9405.9724
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	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9405.9724
Space heating per m2	(98c) / (4) =											78.3831 (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 %)	219.3000 (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	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	794.9674	644.7499	580.4247	368.0206	209.1431	0.0000	0.0000	0.0000	0.0000	343.1991	564.8330	783.7514 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												4289.0891 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.4000
Water heating fuel used												1605.2322 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												254.8716 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6149.1930 (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	4289.0891	0.1542	661.4948 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			887.7551 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Total CO2, kg/year			924.5410 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.7000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4289.0891	1.5710	6738.1160 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			9179.9810 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Total Primary energy kWh/year			9570.9117 (286)
Dwelling Primary energy Rate (DPER)			79.7600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (5)

2. Ventilation rate

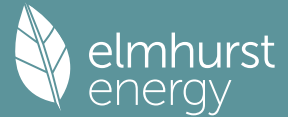
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1477 (8)
Pressure Test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8977 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8977 (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	1.1445	1.1221	1.0996	0.9874	0.9650	0.8528	0.8528	0.8303	0.8977	0.9650	1.0099	1.0548 (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	1.1445	1.1221	1.0996	0.9875	0.9656	0.8636	0.8636	0.8447	0.9029	0.9656	1.0099	1.0548 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)

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Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m2)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 26772.0000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 223.1000 (35)
 Thermal bridges (Default value 0.200 * total exposed area) 60.5000 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 138.6632 (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	102.3080	100.3020	98.2959	88.2728	86.3144	77.1981	77.1981	75.5099	80.7096	86.3144	90.2718	94.2838	(38)
Heat transfer coeff	240.9711	238.9651	236.9591	226.9359	224.9776	215.8612	215.8612	214.1730	219.3727	224.9776	228.9349	232.9470	(39)
Average = Sum(39)m / 12 =												226.7447	
HLP	2.0081	1.9914	1.9747	1.8911	1.8748	1.7988	1.7988	1.7848	1.8281	1.8748	1.9078	1.9412	(40)
HLP (average)												1.8895	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8633 (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	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)												68.8697	(43)
Daily hot water use	75.1369	73.0755	70.8250	68.0242	65.5255	62.9288	62.3895	64.6354	66.9389	69.6055	72.4310	75.0315	(44)
Energy conte	118.9985	104.0585	108.8554	93.1218	88.2100	77.3783	75.4547	80.0322	82.5423	94.4540	103.1913	117.4812	(45)
Energy content (annual)										Total = Sum(45)m =		1143.7782	
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 (or HIU 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	101.1487	88.4497	92.5271	79.1535	74.9785	65.7716	64.1365	68.0273	70.1610	80.2859	87.7126	99.8590	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	101.1487	88.4497	92.5271	79.1535	74.9785	65.7716	64.1365	68.0273	70.1610	80.2859	87.7126	99.8590	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		972.2114	(64)
Electric shower(s)	57.8427	51.5384	56.2779	53.7053	54.7131	52.1910	53.9307	54.7131	53.7053	56.2779	55.2197	57.8427	(64a)
Heat gains from water heating, kWh/month	39.7479	34.9970	37.2013	33.2147	32.4229	29.4906	29.5168	30.6851	30.9666	34.1410	35.7331	39.4254	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												657.9578	(64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.5482	164.4640	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	153.4998	148.5482	153.4998	148.5482	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	(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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)	53.4246	52.0789	50.0017	46.1315	43.5791	40.9592	39.6731	41.2434	43.0091	45.8884	49.6293	52.9912	(72)
Total internal gains	553.1356	570.6655	545.2142	530.4182	502.8717	486.3662	467.5441	466.1548	480.3303	494.1354	522.8704	540.1179	(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	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
South	3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)
West	8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)

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North	1.5000		15.6897		0.6300		0.8000		1.0000		10.6753 (82)	
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	712.5716	855.8481	969.7216	1110.9241	1200.6904	1199.5010	1146.6508	1055.0095	958.6312	818.7498	716.3597	674.9061 (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	30.8612	31.1203	31.3838	32.7699	33.0551	34.4511	34.4511	34.7227	33.8997	33.0551	32.4838	31.9243	
alpha	3.0574	3.0747	3.0923	3.1847	3.2037	3.2967	3.2967	3.3148	3.2600	3.2037	3.1656	3.1283	
util living area	0.9959	0.9923	0.9856	0.9659	0.9204	0.8183	0.6906	0.7413	0.9035	0.9772	0.9931	0.9966 (86)	
MIT	18.2359	18.4928	18.9199	19.5766	20.1577	20.6541	20.8634	20.8239	20.4430	19.6863	18.9038	18.2663 (87)	
Th 2	19.3279	19.3391	19.3503	19.4069	19.4181	19.4708	19.4708	19.4807	19.4504	19.4181	19.3955	19.3728 (88)	
util rest of house	0.9944	0.9896	0.9800	0.9511	0.8799	0.7144	0.5053	0.5684	0.8361	0.9647	0.9902	0.9954 (89)	
MIT 2	16.8990	17.1618	17.5935	18.2772	18.8380	19.3027	19.4359	19.4286	19.1302	18.3993	17.6092	16.9582 (90)	
Living area fraction	fLA = Living area / (4) =												0.4625 (91)
MIT	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (92)	
Temperature adjustment													0.0000
adjusted MIT	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9920	0.9858	0.9744	0.9444	0.8809	0.7509	0.5903	0.6459	0.8520	0.9599	0.9869	0.9934 (94)
Useful gains	706.8744	843.7024	944.9330	1049.1990	1057.6763	900.6590	676.8140	681.4676	816.7131	785.8962	706.9861	670.4705 (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	3184.9967	3077.2488	2774.0785	2264.4043	1743.2011	1150.0473	754.6855	786.8576	1236.6777	1888.5801	2543.0033	3112.9151 (97)
Space heating kWh	1843.7230	1500.9432	1360.8842	874.9478	510.0305	0.0000	0.0000	0.0000	0.0000	820.3968	1321.9324	1817.1788 (98a)
Space heating requirement - total per year (kWh/year)	10050.0367											
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	1843.7230	1500.9432	1360.8842	874.9478	510.0305	0.0000	0.0000	0.0000	0.0000	820.3968	1321.9324	1817.1788 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	10050.0367											
Space heating per m2	(98c) / (4) = 83.7503 (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	2029.0957	1597.3732	1627.7151	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.5849	0.6702	0.6267	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1186.7847	1070.5882	1020.0704	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1319.2419	1261.8808	1162.0020	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	95.3692	142.3217	105.5971	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement	85.8220 (107)											
Energy for space heating	83.7503 (99)											
Energy for space cooling	0.7152 (108)											
Total	84.4655 (109)											
Fabric Energy Efficiency (DFEE)	84.5 (109)											

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

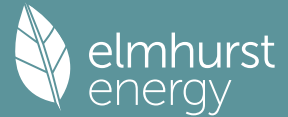
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		
Dwelling volume	(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 270.8750 (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)

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000	Air changes per hour	0.1108 (8)
Pressure test			No	
Pressure Test Method			Blower Door	
Measured/design AP50				15.0000 (17)
Infiltration rate				0.8608 (18)
Number of sides sheltered				0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =			0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m2)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	138.6632 (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	98.1005	96.1770	94.2534	84.7621	82.9615	74.5796	74.5796	73.0274	77.8082	82.9615	86.6040	90.4063 (38)
Average = Sum(39)m / 12 =	236.7636	234.8401	232.9166	223.4252	221.6247	213.2427	213.2427	211.6905	216.4713	221.6247	225.2672	229.0695 (39)
												223.3482
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.9730	1.9570	1.9410	1.8619	1.8469	1.7770	1.7770	1.7641	1.8039	1.8469	1.8772	1.9089 (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												2.8633 (42)
Hot water usage for mixer showers												
Hot water usage for baths	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454 (42a)
Hot water usage for other uses	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783 (42b)
Average daily hot water use (litres/day)	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532 (42c)
												143.7856 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2388.2662
Water storage loss (or HIU loss):	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				3056.3622 (64)

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432 (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)												
	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)												
	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
Total internal gains	745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589 (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					1.2500	10.6334		0.6300	0.7000	0.7700	4.0621 (74)	
South					3.1500	46.7521		0.6300	0.7000	0.7700	45.0073 (78)	
North					1.2500	10.6334		0.6300	0.7000	0.7700	4.0621 (74)	
East					1.4500	19.6403		0.6300	0.7000	0.7700	8.7034 (76)	
South					2.4500	46.7521		0.6300	0.7000	0.7700	35.0057 (78)	
West					8.6500	19.6403		0.6300	0.7000	0.7700	51.9201 (80)	
North					1.5000	15.6897		0.6300	0.8000	1.0000	10.6753 (82)	
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	905.2243	1028.5383	1145.2697	1259.1626	1334.1978	1311.3788	1254.7961	1168.0580	1079.1954	964.1069	879.4507	861.2472 (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	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643
util living area	0.9919	0.9873	0.9773	0.9524	0.8975	0.7839	0.6475	0.6954	0.8734	0.9645	0.9876	0.9932 (86)
MIT	18.4363	18.6736	19.0953	19.7137	20.2594	20.7077	20.8908	20.8595	20.5239	19.8210	19.0702	18.4613 (87)
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947 (88)
util rest of house	0.9892	0.9829	0.9690	0.9330	0.8495	0.6740	0.4660	0.5221	0.7944	0.9461	0.9826	0.9909 (89)
MIT 2	17.1130	17.3556	17.7799	18.4203	18.9389	19.3489	19.4594	19.4558	19.2041	18.5402	17.7871	17.1663 (90)
Living area fraction									FLA = Living area / (4) =			0.4625 (91)
MIT	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9852	0.9776	0.9620	0.9264	0.8538	0.7148	0.5495	0.6006	0.8163	0.9412	0.9778	0.9875 (94)
Useful gains	891.8568	1005.4692	1101.7118	1166.5286	1139.0961	937.3574	689.5638	701.5593	880.9327	907.4610	859.9615	850.4606 (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	3178.5572	3068.2269	2768.9735	2260.7296	1739.6805	1146.6728	750.9188	784.3153	1237.0292	1891.0279	2541.1371	3107.3824 (97)
Space heating kWh	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98a)
Space heating requirement - total per year (kWh/year)												9183.9506
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	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9183.9506
Space heating per m2												(98c) / (4) = 76.5329 (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 %)												219.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)												

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775.7889	632.0899	565.6373	359.2452	203.7550	0.0000	0.0000	0.0000	0.0000	333.6862	551.9592	765.6862	(211)
Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement												
304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)
Efficiency of water heater												
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)
Fuel for water heating, kWh/month												
159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696	(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	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	32.4581	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											4187.8480	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											190.4000	
Water heating fuel used											1605.2322	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year											0.0000	(231)
Electricity for lighting (calculated in Appendix L)											254.8716	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											0.0000	(233)
Wind generation											0.0000	(234)
Hydro-electric generation (Appendix N)											0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(235)
Appendix Q - special features												
Energy saved or generated											-0.0000	(236)
Energy used											0.0000	(237)
Total delivered energy for all uses											6047.9518	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4187.8480	16.4900	690.5761 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	16.4900	264.7028 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.8716	16.4900	42.0283 (250)
Additional standing charges			0.0000 (251)
Total energy cost			997.3073 (255)

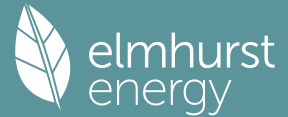
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 2.1759 (257)
SAP value	64.7280
SAP rating (Section 12)	65 (258)
SAP band	D

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	4187.8480	0.1542	645.9322 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			872.1925 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Total CO2, kg/year			908.9784 (272)
CO2 emissions per m2			7.5700 (273)
EI value			92.6180
EI rating			93 (274)
EI band			A

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CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (5)

2. Ventilation rate

m3 per hour												
Number of open chimneys	0 * 80 =	0.0000	(6a)									
Number of open flues	0 * 20 =	0.0000	(6b)									
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)									
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)									
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)									
Number of blocked chimneys	0 * 20 =	0.0000	(6f)									
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)									
Number of passive vents	0 * 10 =	0.0000	(7b)									
Number of flueless gas fires	0 * 40 =	0.0000	(7c)									
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1108	(8)									
Pressure test	No											
Pressure Test Method	Blower Door											
Measured/design AP50	15.0000	(17)										
Infiltration rate	0.8608	(18)										
Number of sides sheltered	0	(19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)									
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8608	(21)									
Wind speed	Jan 4.2000	Feb 3.9000	Mar 3.9000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.1000	Sep 3.2000	Oct 3.5000	Nov 3.4000	Dec 3.8000 (22)
Wind factor	1.0500	0.9750	0.9750	0.9250	0.9250	0.8250	0.8500	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)
Adj infilt rate	0.9038	0.8392	0.8392	0.7962	0.7962	0.7101	0.7316	0.6671	0.6886	0.7532	0.7316	0.8177 (22b)
Effective ac	0.9084	0.8522	0.8522	0.8170	0.8170	0.7521	0.7676	0.7225	0.7371	0.7836	0.7676	0.8343 (25)

3. Heat losses and heat loss parameter

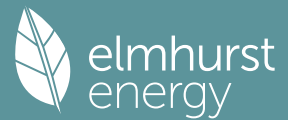
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	78.1632			(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)
Point Thermal Bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	138.6632 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 81.2023	Feb 76.1732	Mar 76.1732	Apr 73.0274	May 73.0274	Jun 67.2325	Jul 68.6191	Aug 64.5834	Sep 65.8872	Oct 70.0471	Nov 68.6191	Dec 74.5796 (38)
Heat transfer coeff	219.8655	214.8363	214.8363	211.6905	211.6905	205.8956	207.2823	203.2465	204.5504	208.7103	207.2823	213.2427 (39)
Average = Sum(39)m / 12 =												210.2608
HLP	Jan 1.8322	Feb 1.7903	Mar 1.7903	Apr 1.7641	May 1.7641	Jun 1.7158	Jul 1.7274	Aug 1.6937	Sep 1.7046	Oct 1.7393	Nov 1.7274	Dec 1.7770 (40)
HLP (average)												1.7522
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454 (42a)
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783 (42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532 (42c)
Average daily hot water use (litres/day)												143.7856 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Energy conte	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2388.2662
Water storage loss (or HIU loss):	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss												
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
Primary loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
WWHRS	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Electric shower(s)	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Total per year (kWh/year) = Sum(64)m =												3056.3622 (64)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978 (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	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432 (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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
Total internal gains	745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589 (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				1.2500	12.6907		0.6300		0.7000		0.7700		4.8481 (74)
South				3.1500	53.4173		0.6300		0.7000		0.7700		51.4238 (78)
North				1.2500	12.6907		0.6300		0.7000		0.7700		4.8481 (74)
East				1.4500	23.7106		0.6300		0.7000		0.7700		10.5071 (76)
South				2.4500	53.4173		0.6300		0.7000		0.7700		39.9963 (78)
West				8.6500	23.7106		0.6300		0.7000		0.7700		62.6803 (80)
North				1.5000	18.5195		0.6300		0.8000		1.0000		12.6007 (82)
Solar gains	186.9043	293.1166	436.0512	617.8060	725.5033	806.1518	750.7118	656.5570	525.4479	354.1873	223.6333	152.7020	(83)
Total gains	932.6926	1036.4722	1156.8135	1296.4627	1361.8824	1404.3958	1326.4012	1235.7603	1126.3424	993.6799	909.5947	879.1610	(84)

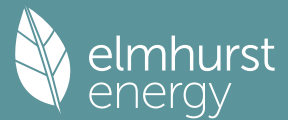
7. Mean internal temperature (heating season)

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	33.8237	34.6155	34.6155	35.1299	35.1299	36.1186	35.8770	36.5894	36.3562	35.6315	35.8770	34.8742
alpha	3.2549	3.3077	3.3077	3.3420	3.3420	3.4079	3.3918	3.4393	3.4237	3.3754	3.3918	3.3249
util living area	0.9905	0.9862	0.9740	0.9417	0.8699	0.7142	0.5706	0.5834	0.8334	0.9530	0.9843	0.9921 (86)
MIT	18.7324	18.9457	19.3525	19.9074	20.4284	20.8141	20.9366	20.9368	20.6563	20.0402	19.3698	18.7585 (87)
Th 2	19.4475	19.4768	19.4768	19.4952	19.4952	19.5295	19.5213	19.5453	19.5375	19.5128	19.5213	19.4861 (88)
util rest of house	0.9874	0.9815	0.9645	0.9184	0.8107	0.5880	0.3837	0.3915	0.7384	0.9287	0.9779	0.9894 (89)
MIT 2	17.4708	17.7017	18.1032	18.6534	19.1307	19.4538	19.5093	19.5337	19.3628	18.8031	18.1544	17.5228 (90)
Living area fraction	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	0.4625 (91)
MIT	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	18.0943 (92)
Temperature adjustment	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	0.0000
adjusted MIT	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	18.0943 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9832	0.9764	0.9578	0.9132	0.8218	0.6404	0.4711	0.4816	0.7707	0.9257	0.9730	0.9858 (94)
Ext temp.	917.0184	1011.9721	1108.0083	1183.9326	1119.1361	899.4313	624.9121	595.1286	868.1079	919.8370	885.0480	866.7171 (95)
Heat loss rate W	4.8000	5.2000	6.9000	9.3000	12.3000	15.1000	17.0000	17.1000	14.5000	11.2000	7.7000	4.8000 (96)
Space heating kWh	2914.1565	2809.4212	2530.9869	2102.8019	1573.0475	1025.9686	656.9717	626.5395	1117.0532	1706.2618	2283.5367	2834.9196 (97)
Space heating kWh	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426 (98a)

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Space heating requirement - total per year (kWh/year)	7808.1032										
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 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000										
Space heating kWh	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	7808.1032										
Space heating per m2	(98c) / (4) = 65.0675 (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 %)												219.3000 (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	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	677.5516	550.7915	482.7616	301.6808	153.9946	0.0000	0.0000	0.0000	0.0000	266.8035	459.1481	667.7349 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3560.4666 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.4000
Water heating fuel used												1605.2322 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												254.8716 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												5420.5704 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3560.4666	27.6700	985.1811 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	27.6700	444.1678 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.8716	27.6700	70.5230 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1499.8718 (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	3560.4666	0.1546	550.3551 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			776.6154 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)

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Energy for lighting 254.8716 0.1443 36.7859 (268)
Total CO₂, kg/year 813.4013 (272)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	3560.4666	1.5723	5598.0522 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			8039.9173 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Total Primary energy kWh/year			8430.8479 (286)

SAP 10 EPC IMPROVEMENTS

EC2401C (BE CLEAN)

Current energy efficiency rating: D 65
Current environmental impact rating: A 93

	Recommended	Recommended	Recommended
N Solar water heating			
U Solar photovoltaic panels			
V2 Wind turbine			
Recommended measures:	SAP change	Cost change	CO ₂ change
N Solar water heating	+ 1.7	-£ 91	-41 kg (5.0%)
U Solar photovoltaic panels	+ 5.6	-£ 279	-136 kg (17.6%)
V2 Wind turbine	+ 14.6	-£ 693	-347 kg (54.5%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£91	0.34 kg/m ²	D 66 A 93
Solar photovoltaic panels	£279	1.13 kg/m ²	C 72 A 94
Wind turbine	£693	2.89 kg/m ²	B 87 A 97
Total Savings	£1062	4.37 kg/m ²	

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

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £1500	Potential £1409	Saving £91
Electricity			
Space heating	£985	£1008	-£23
Water heating	£444	£330	£114
Lighting	£71	£71	£0
Generated (PV)	-£0	-£279	£279
Generated (wind)	-£0	-£693	£693
Total cost of fuels	£1500	£437	£1063
Total cost of uses	£1500	£437	£1063
Delivered energy	45 kWh/m ²	13 kWh/m ²	32 kWh/m ²
Carbon dioxide emissions	0.8 tonnes	0.3 tonnes	0.5 tonnes
CO ₂ emissions per m ²	7 kg/m ²	2 kg/m ²	4 kg/m ²
Primary energy	70 kWh/m ²	22 kWh/m ²	48 kWh/m ²

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

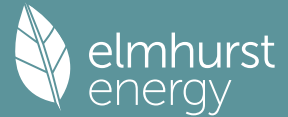
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (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)

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Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1108 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.8608	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114	(22b)
Effective ac	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114	(25)

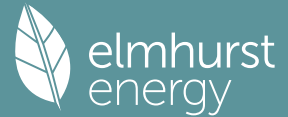
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1000	3.0000	6.3000			(26)
Windows (existing)			4.4000	1.6791	7.3881			(27)
Windows (new)			13.8000	1.3258	18.2955			(27)
Roof Windows			1.5000	1.3258	1.9886			(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000	(28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000	(29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000	(29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000	(30)
Total net area of external elements Aum(A, m2)			302.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.1632			(33)
Main dwelling								
Internal Wall			50.0000			9.0000	450.0000	(32c)
Internal Floor			44.5000			18.0000	801.0000	(32d)
Internal Ceiling			44.5000			9.0000	400.5000	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		26772.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		138.6632	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454	(42a)
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)													143.7856 (43)
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy conte	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Energy content (annual)													Total = Sum(45)m = 2388.2662
Distribution loss (46)m = 0.15 x (45)m	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	304.4317	269.2793	284.4789	243.7482	229.5403	205.1876	201.3431	210.9942	220.3984	251.1063	269.4173	300.9645	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)

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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												638.1186 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												638.1186
Solar input	-0.0000	-16.1850	-59.1450	-81.9975	-108.0738	-99.7878	-99.1464	-86.1521	-58.8398	-28.7913	-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	304.4317	253.0944	225.3339	161.7507	121.4665	105.3998	102.1968	124.8421	161.5586	222.3150	269.4173	300.9645 (64)
								Total per year (kWh/year) = Sum(64)m =				2352.7712 (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	127.7506	113.4953	120.4638	103.5603	96.8679	88.0026	87.3836	91.0276	96.4280	109.3674	115.2526	126.5978 (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	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432 (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)												
	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)												
	171.7078	168.8918	161.9137	143.8338	130.1987	122.2258	117.4510	122.3489	133.9278	146.9992	160.0731	170.1583 (72)
Total internal gains	745.7883	743.3557	719.2616	671.1527	622.6218	584.2366	561.6819	566.1964	594.8913	637.9918	685.9614	726.4589 (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					1.2500	10.6334		0.6300	0.7000	0.7700	4.0621 (74)	
South					3.1500	46.7521		0.6300	0.7000	0.7700	45.0073 (78)	
North					1.2500	10.6334		0.6300	0.7000	0.7700	4.0621 (74)	
East					1.4500	19.6403		0.6300	0.7000	0.7700	8.7034 (76)	
South					2.4500	46.7521		0.6300	0.7000	0.7700	35.0057 (78)	
West					8.6500	19.6403		0.6300	0.7000	0.7700	51.9201 (80)	
North					1.5000	15.6897		0.6300	0.8000	1.0000	10.6753 (82)	
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	905.2243	1028.5383	1143.7689	1251.6586	1320.4405	1297.3714	1240.7886	1155.0511	1073.1922	962.6061	879.4507	861.2472 (84)

7. Mean internal temperature (heating season)

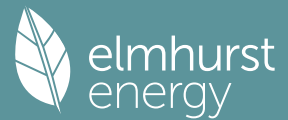
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643
util living area	0.9919	0.9873	0.9774	0.9532	0.8998	0.7879	0.6524	0.7002	0.8748	0.9646	0.9876	0.9932 (86)
MIT	18.4363	18.6736	19.0941	19.7083	20.2515	20.7026	20.8882	20.8564	20.5207	19.8199	19.0702	18.4613 (87)
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947 (88)
util rest of house	0.9892	0.9829	0.9691	0.9340	0.8526	0.6786	0.4705	0.5269	0.7964	0.9463	0.9826	0.9909 (89)
MIT 2	17.1130	17.3556	17.7788	18.4154	18.9324	19.3459	19.4586	19.4547	19.2019	18.5391	17.7871	17.1663 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	17.7250	17.9652	18.3871	19.0134	19.5425	19.9734	20.1198	20.1030	19.8118	19.1315	18.3805	17.7652 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7250	17.9652	18.3871	19.0134	19.5425	19.9734	20.1198	20.1030	19.8118	19.1315	18.3805	17.7652 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9852	0.9776	0.9621	0.9274	0.8565	0.7190	0.5542	0.6053	0.8180	0.9415	0.9778	0.9875 (94)
Useful gains	891.8568	1005.4692	1100.4019	1160.7549	1130.9487	932.7593	687.6736	699.1921	877.8829	906.2469	859.9615	850.4606 (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	3178.5572	3068.2269	2768.7076	2259.5801	1738.0813	1145.8349	750.5758	783.8902	1236.4498	1890.7884	2541.1371	3107.3824 (97)
Space heating kWh	1701.3051	1386.1732	1241.2194	791.1542	451.7067	0.0000	0.0000	0.0000	0.0000	732.4989	1210.4465	1679.1498 (98a)
Space heating requirement - total per year (kWh/year)												9193.6538
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	1701.3051	1386.1732	1241.2194	791.1542	451.7067	0.0000	0.0000	0.0000	0.0000	732.4989	1210.4465	1679.1498 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9193.6538
Space heating per m2										(98c) / (4) =		76.6138 (99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												219.3000	(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	1701.3051	1386.1732	1241.2194	791.1542	451.7067	0.0000	0.0000	0.0000	0.0000	732.4989	1210.4465	1679.1498	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	775.7889	632.0899	565.9915	360.7634	205.9766	0.0000	0.0000	0.0000	0.0000	334.0168	551.9592	765.6862	(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	304.4317	253.0944	225.3339	161.7507	121.4665	105.3998	102.1968	124.8421	161.5586	222.3150	269.4173	300.9645	(64)
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)
Fuel for water heating, kWh/month	159.8906	132.9277	118.3476	84.9531	63.7954	55.3570	53.6748	65.5683	84.8522	116.7621	141.5007	158.0696	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-41.2616	-63.4889	-98.2220	-115.3646	-123.2313	-98.7283	-97.2796	-91.3078	-80.2390	-73.3258	-46.7218	-35.0546	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	-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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4192.2726	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1235.6991	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.8716	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												-964.2255	(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												2295.7393	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4192.2726	16.4900	691.3057	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1235.6991	16.4900	203.7668	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	254.8716	16.4900	42.0283	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-964.2255	16.4900	-159.0008	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-159.0008	(252)
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247	
Wind Turbine electricity exported	0.0000	5.5900	0.0000	
Total			-412.7247	(252)
Total energy cost			378.5674	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.8260	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	86.6111	
SAP rating (Section 12)		87	(258)
SAP band		B	

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4192.2726	0.1542	646.5417 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1235.6991	0.1451	179.3150 (264)
Space and water heating			825.8568 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-964.2255	0.1349	-130.0778
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-130.0778 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-347.1801 (269)
Total CO2, kg/year			396.4817 (272)
CO2 emissions per m2			3.3000 (273)
EI value			96.7801
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (5)

2. Ventilation rate

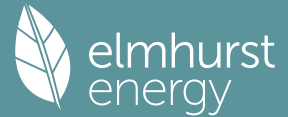
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	3.9000	3.7000	3.7000	3.3000	3.4000	3.1000	3.2000	3.5000	3.4000	3.8000 (22)
Wind factor	1.0500	0.9750	0.9750	0.9250	0.9250	0.8250	0.8500	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)
Adj infilt rate	0.9038	0.8392	0.8392	0.7962	0.7962	0.7101	0.7316	0.6671	0.6886	0.7532	0.7316	0.8177 (22b)
Effective ac	0.9084	0.8522	0.8522	0.8170	0.8170	0.7521	0.7676	0.7225	0.7371	0.7836	0.7676	0.8343 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m2)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	138.6632 (37)

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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	81.2023	76.1732	76.1732	73.0274	73.0274	67.2325	68.6191	64.5834	65.8872	70.0471	68.6191	74.5796	(38)
Heat transfer coeff	219.8655	214.8363	214.8363	211.6905	211.6905	205.8956	207.2823	203.2465	204.5504	208.7103	207.2823	213.2427	(39)
Average = Sum(39)m / 12 =												210.2608	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.8322	1.7903	1.7903	1.7641	1.7641	1.7158	1.7274	1.6937	1.7046	1.7393	1.7274	1.7770	(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													2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454	(42a)
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)												143.7856	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Distribution loss (46)m = 0.15 x (45)m	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	304.4317	269.2793	284.4789	243.7482	229.5403	205.1876	201.3431	210.9942	220.3984	251.1063	269.4173	300.9645	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												719.6078	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												719.6078	
Solar input	-0.0000	-18.6201	-62.7631	-89.5694	-113.3796	-114.6179	-111.1346	-99.2782	-68.7819	-36.9069	-4.5559	-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	(64a)
Output from w/h	304.4317	250.6592	221.7158	154.1788	116.1607	90.5697	90.2085	111.7160	151.6165	214.1994	264.8613	300.9645	(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	127.7506	113.4953	120.4638	103.5603	96.8679	88.0026	87.3836	91.0276	96.4280	109.3674	115.2526	126.5978	(65)

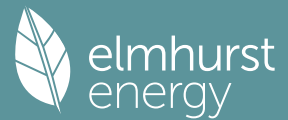
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Pumps, fans	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Total internal gains	171.7078	168.8918	161.9137	143.8338	130.1987	122.2258	117.4510	122.3489	133.9278	146.9992	160.0731	170.1583	(72)
	745.7883	743.3557	719.2616	671.1527	622.6218	584.2366	561.6819	566.1964	594.8913	637.9918	685.9614	726.4589	(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	1.2500	12.6907	0.6300	0.7000	0.7700	4.8481 (74)
South	3.1500	53.4173	0.6300	0.7000	0.7700	51.4238 (78)
North	1.2500	12.6907	0.6300	0.7000	0.7700	4.8481 (74)

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East			1.4500		23.7106		0.6300		0.7000		0.7700		10.5071 (76)
South			2.4500		53.4173		0.6300		0.7000		0.7700		39.9963 (78)
West			8.6500		23.7106		0.6300		0.7000		0.7700		62.6803 (80)
North			1.5000		18.5195		0.6300		0.8000		1.0000		12.6007 (82)

Solar gains	186.9043	293.1166	436.0512	617.8060	725.5033	806.1518	750.7118	656.5570	525.4479	354.1873	223.6333	152.7020 (83)
Total gains	932.6926	1036.4722	1155.3127	1288.9587	1348.1251	1390.3883	1312.3938	1222.7534	1120.3392	992.1791	909.5947	879.1610 (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	33.8237	34.6155	34.6155	35.1299	35.1299	36.1186	35.8770	36.5894	36.3562	35.6315	35.8770	34.8742	
alpha	3.2549	3.3077	3.3077	3.3420	3.3420	3.4079	3.3918	3.4393	3.4237	3.3754	3.3918	3.3249	
util living area	0.9905	0.9862	0.9741	0.9426	0.8727	0.7184	0.5752	0.5881	0.8351	0.9532	0.9843	0.9921 (86)	
MIT	18.7324	18.9457	19.3513	19.9022	20.4212	20.8105	20.9350	20.9352	20.6536	20.0391	19.3698	18.7585 (87)	
Th 2	19.4475	19.4768	19.4768	19.4952	19.4952	19.5295	19.5213	19.5453	19.5375	19.5128	19.5213	19.4861 (88)	
util rest of house	0.9874	0.9815	0.9646	0.9195	0.8143	0.5924	0.3875	0.3954	0.7405	0.9289	0.9779	0.9894 (89)	
MIT 2	17.4708	17.7017	18.1021	18.6487	19.1251	19.4520	19.5090	19.5334	19.3610	18.8021	18.1544	17.5228 (90)	
Living area fraction										FLA = Living area / (4) =		0.4625 (91)	
MIT	18.0543	18.2770	18.6799	19.2284	19.7246	20.0803	20.1685	20.1817	19.9588	19.3742	18.7166	18.0943 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.0543	18.2770	18.6799	19.2284	19.7246	20.0803	20.1685	20.1817	19.9588	19.3742	18.7166	18.0943 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9764	0.9579	0.9143	0.8249	0.6447	0.4754	0.4859	0.7727	0.9259	0.9730	0.9858 (94)	
Useful gains	917.0184	1011.9721	1106.7239	1178.4624	1112.0203	896.3311	623.8502	594.0870	865.6356	918.6960	885.0480	866.7171 (95)	
Ext temp.	4.8000	5.2000	6.9000	9.3000	12.3000	15.1000	17.0000	17.1000	14.5000	11.2000	7.7000	4.8000 (96)	
Heat loss rate W	2914.1565	2809.4212	2530.7399	2101.7534	1571.7098	1025.4277	656.7774	626.3504	1116.6092	1706.0458	2283.5367	2834.9196 (97)	
Space heating kWh	1485.8707	1207.8858	1059.4679	664.7695	342.0089	0.0000	0.0000	0.0000	0.0000	585.7883	1006.9119	1464.3426 (98a)	
Space heating requirement - total per year (kWh/year)												7817.0457	
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	1485.8707	1207.8858	1059.4679	664.7695	342.0089	0.0000	0.0000	0.0000	0.0000	585.7883	1006.9119	1464.3426 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												7817.0457	
Space heating per m2										(98c) / (4) =		65.1420 (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 %)													219.3000 (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	1485.8707	1207.8858	1059.4679	664.7695	342.0089	0.0000	0.0000	0.0000	0.0000	585.7883	1006.9119	1464.3426 (98)	
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)	
Space heating fuel (main heating system)	677.5516	550.7915	483.1135	303.1325	155.9548	0.0000	0.0000	0.0000	0.0000	267.1173	459.1481	667.7349 (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	304.4317	250.6592	221.7158	154.1788	116.1607	90.5697	90.2085	111.7160	151.6165	214.1994	264.8613	300.9645 (64)	
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)	
Fuel for water heating, kWh/month	159.8906	131.6487	116.4474	80.9762	61.0088	47.5681	47.3784	58.6744	79.6305	112.4997	139.1078	158.0696 (219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)	
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-47.6315	-64.7634	-99.0986	-118.0729	-122.0923	-104.2338	-101.6923	-96.4045	-84.9996	-77.5332	-52.7827	-39.3301 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													3564.5443 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													190.4000

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Water heating fuel used	1192.9002 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
pump for solar water heating	80.0000 (230g)
Total electricity for the above, kWh/year	80.0000 (231)
Electricity for lighting (calculated in Appendix L)	254.8716 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1008.6350 (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	1580.8027 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3564.5443	27.6700	986.3094 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1192.9002	27.6700	330.0755 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	27.6700	22.1360 (249)
Energy for lighting	254.8716	27.6700	70.5230 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1008.6350	27.6700	-279.0893
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-279.0893 (252)
Wind Turbine electricity used in dwelling	-2502.8785	27.6700	-692.5465
Wind Turbine electricity exported	0.0000	5.8100	0.0000
Total			-692.5465 (252)
Total energy cost			437.4081 (255)

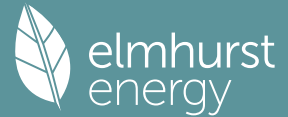
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3564.5443	0.1546	550.9180 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1192.9002	0.1458	173.8994 (264)
Space and water heating			724.8174 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1008.6350	0.1350	-136.1774
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-136.1774 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-347.1801 (269)
Total CO2, kg/year			289.3427 (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	3564.5443	1.5722	5604.2121 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1192.9002	1.5393	1836.1782 (278)
Space and water heating			7440.3903 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1008.6350	1.4990	-1511.9651
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1511.9651 (283)
Wind Turbine electricity used in dwelling	-2502.8785	1.5128	-3786.3546
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-3786.3546 (283)
Total Primary energy kWh/year			2654.0252 (286)

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Plot Reference	EC2401				Issued on Date	21/04/2026
Assessment Reference	EC2401D (BE GREEN)			Plot Type Ref	EC-24	
Plot Address	2 Bedroom Dwelling, Polecat Lane, Copsale, West Sussex, RH13 6QR				SAP Version	10.2
SAP Rating	92 A	DER	2.37	TER		
Environmental	98 A	% DER < TER				N/A
CO ₂ Emissions (t/year)	0.16	DFEE	84.47	TFEE		
Compliance Check	N/A	% DFEE < TFEE				
% DPER < TPER		DPER	20.99	TPER		
Assessor Details	Mr. Joe Solti				Assessor ID	5122-0001
Client	KG Designs, .					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
Effective ac	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)

$$\begin{aligned} (33) + (36) + (36a) &= 138.6632 \quad (37) \end{aligned}$$
[illegible]

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)
Energy conte	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Energy content (annual)										Total =	Sum(45)m =	2388.2662

[illegible]

Total per year (kWh/year) = Sum(64)m = 3056.3022 (64)											
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)											
Heat gains from water heating, kWh/month	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526 (65)

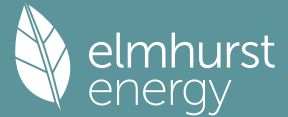
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.5482	164.4640	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	153.4998	148.5482	153.4998	148.5482 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166 (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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
Total internal gains	671.4189	687.4784	658.6270	635.6244	603.2486	581.6403	559.3295	560.2672	577.2521	596.7471	633.3142	657.2850 (73)

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

North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
South	3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)
West	8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)
North	1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643
util living area	0.9937	0.9891	0.9805	0.9565	0.9030	0.7886	0.6532	0.7024	0.8792	0.9685	0.9896	0.9947 (86)
MIT	18.3756	18.6287	19.0469	19.6828	20.2401	20.7017	20.8878	20.8550	20.5113	19.7889	19.0273	18.4040 (87)
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947 (88)
util rest of house	0.9915	0.9853	0.9732	0.9384	0.8569	0.6795	0.4713	0.5291	0.8023	0.9519	0.9853	0.9928 (89)
MIT 2	17.0529	17.3113	17.7329	18.3916	18.9230	19.3454	19.4585	19.4542	19.1951	18.5101	17.7449	17.1095 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.6646	17.9206	18.3407	18.9888	19.5322	19.9726	20.1195	20.1021	19.8039	19.1015	18.3380	17.7082 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.6646	17.9206	18.3407	18.9888	19.5322	19.9726	20.1195	20.1021	19.8039	19.1015	18.3380	17.7082 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9882	0.9805	0.9667	0.9318	0.8603	0.7197	0.5550	0.6075	0.8231	0.9470	0.9811	0.9900 (94)
Useful gains	821.0318	953.6936	1047.0390	1133.1589	1119.3336	931.8973	687.3507	698.0918	868.8001	872.5369	811.1692	784.1444 (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	3164.2622	3057.7657	2757.8875	2254.0882	1735.7998	1145.6777	750.5172	783.6926	1234.7227	1884.1439	2531.5565	3094.3148 (97)
Space heating kWh	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98a)
Space heating requirement - total per year (kWh/year)												9405.9724
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	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9405.9724
Space heating per m2										(98c) / (4) =		78.3831 (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 %)												219.3000 (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	1743.3634	1413.9365	1272.8713	807.0691	458.6509	0.0000	0.0000	0.0000	0.0000	752.6357	1238.6789	1718.7667 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	794.9674	644.7499	580.4247	368.0206	209.1431	0.0000	0.0000	0.0000	0.0000	343.1991	564.8330	783.7514 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-217.6739	-339.5175	-521.9992	-602.9563	-626.0468	-385.6867	-379.8350	-384.6596	-390.5384	-400.2036	-251.0917	-184.7497 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												4289.0891 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.4000
Water heating fuel used												1605.2322 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												254.8716 (232)

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

PV generation	-4684.9585 (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	

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1464.2345 (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	4289.0891	0.1542	661.4948 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			887.7551 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4684.9585	0.1366	-640.1589
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-640.1589 (269)
Total CO2, kg/year			284.3821 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3700 (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	4289.0891	1.5710	6738.1160 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			9179.9810 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4684.9585	1.5052	-7051.7162
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-7051.7162 (283)
Total Primary energy kWh/year			2519.1954 (286)
Dwelling Primary energy Rate (DPER)			20.9900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

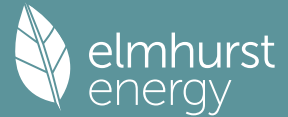
2. Ventilation rate

	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) =	0.1477 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.8977	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8977	(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	1.1445	1.1221	1.0996	0.9874	0.9650	0.8528	0.8528	0.8303	0.8977	0.9650	1.0099	1.0548 (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	1.1445	1.1221	1.0996	0.9875	0.9656	0.8636	0.8636	0.8447	0.9029	0.9656	1.0099	1.0548 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1000	3.0000	6.3000			(26)
Windows (existing)			4.4000	1.6791	7.3881			(27)
Windows (new)			13.8000	1.3258	18.2955			(27)
Roof Windows			1.5000	1.3258	1.9886			(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000	(28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000	(29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000	(29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000	(30)
Total net area of external elements Aum(A, m2)			302.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632			(33)
Main dwelling								
Internal Wall			50.0000			9.0000	450.0000	(32c)
Internal Floor			44.5000			18.0000	801.0000	(32d)
Internal Ceiling			44.5000			9.0000	400.5000	(32e)

Heat capacity Cm = Sum(A x k) (26)...(30) + (32) + (32a)...(32e) = 26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area) 60.5000 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 138.6632 (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 102.3080 100.3020 98.2959 88.2728 86.3144 77.1981 77.1981 75.5099 80.7096 86.3144 90.2718 94.2838 (38)
Average = Sum(39)m / 12 = 226.7447 (39)

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 2.0081 1.9914 1.9747 1.8911 1.8748 1.7988 1.7988 1.7848 1.8281 1.8748 1.9078 1.9412 (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													2.8633 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	75.1369	73.0755	70.8250	68.0242	65.5255	62.9288	62.3895	64.6354	66.9389	69.6055	72.4310	75.0315	(44)
Energy content (annual)	118.9985	104.0585	108.8554	93.1218	88.2100	77.3783	75.4547	80.0322	82.5423	94.4540	103.1913	117.4812	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1143.7782
Water storage loss (or HIU loss):													(46)
Total storage loss													(56)
If cylinder contains dedicated solar storage													(57)
Primary loss													(59)
Combi loss													(61)
Total heat required for water heating calculated for each month													
WWHRS	101.1487	88.4497	92.5271	79.1535	74.9785	65.7716	64.1365	68.0273	70.1610	80.2859	87.7126	99.8590	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	101.1487	88.4497	92.5271	79.1535	74.9785	65.7716	64.1365	68.0273	70.1610	80.2859	87.7126	99.8590	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 972.2114 (64)
Electric shower(s)	57.8427	51.5384	56.2779	53.7053	54.7131	52.1910	53.9307	54.7131	53.7053	56.2779	55.2197	57.8427	(64a)
Heat gains from water heating, kWh/month	39.7479	34.9970	37.2013	33.2147	32.4229	29.4906	29.5168	30.6851	30.9666	34.1410	35.7331	39.4254	(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	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	143.1657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.5482	164.4640	148.5482	153.4998	148.5482	153.4998	148.5482	148.5482	153.4998	148.5482	153.4998	148.5482	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.2132	288.1728	280.7146	264.8371	244.7946	225.9575	213.3731	210.4135	217.8717	233.7492	253.7917	272.6288	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	37.3166	(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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)	53.4246	52.0789	50.0017	46.1315	43.5791	40.9592	39.6731	41.2434	43.0091	45.8884	49.6293	52.9912	(72)
Total internal gains	553.1356	570.6655	545.2142	530.4182	502.8717	486.3662	467.5441	466.1548	480.3303	494.1354	522.8704	540.1179	(73)

6. Solar gains

Full SAP Calculation Printout



[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)	
South	3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)	
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)	
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)	
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)	
West	8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)	
North	1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)	

Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	712.5716	855.8481	969.7216	1110.9241	1200.6904	1199.5010	1146.6508	1055.0095	958.6312	818.7498	716.3597	674.9061 (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	30.8612	31.1203	31.3838	32.7699	33.0551	34.4511	34.4511	34.7227	33.8997	33.0551	32.4838	31.9243
util living area	3.0574	3.0747	3.0923	3.1847	3.2037	3.2967	3.2967	3.3148	3.2600	3.2037	3.1656	3.1283
util living area	0.9959	0.9923	0.9856	0.9659	0.9204	0.8183	0.6906	0.7413	0.9035	0.9772	0.9931	0.9966 (86)
MIT	18.2359	18.4928	18.9199	19.5766	20.1577	20.6541	20.8634	20.8239	20.4430	19.6863	18.9038	18.2663 (87)
Th 2	19.3279	19.3391	19.3503	19.4069	19.4181	19.4708	19.4708	19.4807	19.4504	19.4181	19.3955	19.3728 (88)
util rest of house	0.9944	0.9896	0.9800	0.9511	0.8799	0.7144	0.5053	0.5684	0.8361	0.9647	0.9902	0.9954 (89)
MIT 2	16.8990	17.1618	17.5935	18.2772	18.8380	19.3027	19.4359	19.4286	19.1302	18.3993	17.6092	16.9582 (90)
Living area fraction	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (92)
MIT	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (92)
Temperature adjustment	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (93)
adjusted MIT	17.5173	17.7774	18.2070	18.8782	19.4483	19.9277	20.0962	20.0739	19.7373	18.9945	18.2080	17.5632 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9920	0.9858	0.9744	0.9444	0.8809	0.7509	0.5903	0.6459	0.8520	0.9599	0.9869	0.9934 (94)
Ext temp.	706.8744	843.7024	944.9330	1049.1990	1057.6763	900.6590	676.8140	681.4676	816.7131	785.8962	706.9861	670.4705 (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	3184.9967	3077.2488	2774.0785	2264.4043	1743.2011	1150.0473	754.6855	786.8576	1236.6777	1888.5801	2543.0033	3112.9151 (97)
Space heating requirement - total per year (kWh/year)	1843.7230	1500.9432	1360.8842	874.9478	510.0305	0.0000	0.0000	0.0000	0.0000	820.3968	1321.9324	1817.1788 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1843.7230	1500.9432	1360.8842	874.9478	510.0305	0.0000	0.0000	0.0000	0.0000	820.3968	1321.9324	1817.1788 (98c)
Space heating per m2	(98c) / (4) =											83.7503 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5849	0.6702	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1186.7847	1070.5882	1020.0704	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1319.2419	1261.8808	1162.0020	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	95.3692	142.3217	105.5971	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (108)
Energy for space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (109)
Total	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (110)
Fabric Energy Efficiency (DFEE)	0.0000	0.0000	0.0000	0.0000	0.0000	23.8423	35.5804	26.3993	0.0000	0.0000	0.0000	0.0000 (111)

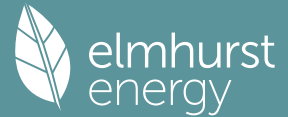
SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)

CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

Full SAP Calculation Printout



2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												3 * 10 = 30.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											30.0000 / (5) = 0.1108 (8)
Pressure test												No
Pressure Test Method												Blower Door
Measured/design AP50												15.0000 (17)
Infiltration rate												0.8608 (18)
Number of sides sheltered												0 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.8608 (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	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114 (22b)
	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114 (25)

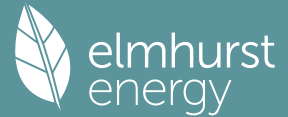
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1000	3.0000	6.3000			(26)
Windows (existing)			4.4000	1.6791	7.3881			(27)
Windows (new)			13.8000	1.3258	18.2955			(27)
Roof Windows			1.5000	1.3258	1.9886			(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000	(28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000	(29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000	(29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000	(30)
Total net area of external elements Aum(A, m2)			302.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632			(33)
Main dwelling								
Internal Wall			50.0000			9.0000	450.0000	(32c)
Internal Floor			44.5000			18.0000	801.0000	(32d)
Internal Ceiling			44.5000			9.0000	400.5000	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		26772.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							223.1000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		138.6632	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454 (42a)	
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783 (42b)	
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532 (42c)	
Average daily hot water use (litres/day)													143.7856 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)	
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2388.2662
	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333 (46)	
Water storage loss (or HIU loss):													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.0000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)	
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	

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Total heat required for water heating calculated for each month												
	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Total per year (kWh/year) = Sum(64)m =												3056.3622 (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	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978 (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	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432 (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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
Total internal gains	745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589 (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					1.2500	10.6334	0.6300	0.7000			0.7700	4.0621 (74)	
South					3.1500	46.7521	0.6300	0.7000			0.7700	45.0073 (78)	
North					1.2500	10.6334	0.6300	0.7000			0.7700	4.0621 (74)	
East					1.4500	19.6403	0.6300	0.7000			0.7700	8.7034 (76)	
South					2.4500	46.7521	0.6300	0.7000			0.7700	35.0057 (78)	
West					8.6500	19.6403	0.6300	0.7000			0.7700	51.9201 (80)	
North					1.5000	15.6897	0.6300	0.8000			1.0000	10.6753 (82)	
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883	(83)
Total gains	905.2243	1028.5383	1145.2697	1259.1626	1334.1978	1311.3788	1254.7961	1168.0580	1079.1954	964.1069	879.4507	861.2472	(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	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643
util living area	0.9919	0.9873	0.9773	0.9524	0.8975	0.7839	0.6475	0.6954	0.8734	0.9645	0.9876	0.9932 (86)
MIT	18.4363	18.6736	19.0953	19.7137	20.2594	20.7077	20.8908	20.8595	20.5239	19.8210	19.0702	18.4613 (87)
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947 (88)
util rest of house	0.9892	0.9829	0.9690	0.9330	0.8495	0.6740	0.4660	0.5221	0.7944	0.9461	0.9826	0.9909 (89)
MIT 2	17.1130	17.3556	17.7799	18.4203	18.9389	19.3489	19.4594	19.4558	19.2041	18.5402	17.7871	17.1663 (90)
Living area fraction	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (91)
MIT	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (92)
Temperature adjustment	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (93)
adjusted MIT	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9852	0.9776	0.9620	0.9264	0.8538	0.7148	0.5495	0.6006	0.8163	0.9412	0.9778	0.9875 (94)
Useful gains	891.8568	1005.4692	1101.7118	1166.5286	1139.0961	937.3574	689.5638	701.5593	880.9327	907.4610	859.9615	850.4606 (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	3178.5572	3068.2269	2768.9735	2260.7296	1739.6805	1146.6728	750.9188	784.3153	1237.0292	1891.0279	2541.1371	3107.3824 (97)
Space heating kWh	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98a)
Space heating requirement - total per year (kWh/year)	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98c)
Space heating per m ²										(98c) / (4) =		76.5329 (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)

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Efficiency of main space heating system 1 (in %)													219.3000	(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	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498	(98)	
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)	
Space heating fuel (main heating system)	775.7889	632.0899	565.6373	359.2452	203.7550	0.0000	0.0000	0.0000	0.0000	333.6862	551.9592	765.6862	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)	
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)	
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696	(217)	
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	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)	
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-217.5657	-339.2320	-521.0176	-601.2903	-623.7809	-385.6867	-379.8350	-384.6596	-390.5384	-399.4698	-250.9147	-184.6760	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													4187.8480	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													190.4000	
Water heating fuel used													1605.2322	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													254.8716	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-4678.6669	(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													1369.2849	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4187.8480	16.4900	690.5761	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1605.2322	16.4900	264.7028	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	254.8716	16.4900	42.0283	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-4678.6669	16.4900	-771.5122	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-771.5122	(252)
Total energy cost			225.7951	(255)

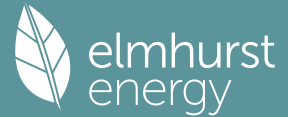
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.4926	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	92.0142	
SAP rating (Section 12)		92	(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	4187.8480	0.1542	645.9322	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1605.2322	0.1410	226.2603	(264)
Space and water heating			872.1925	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)

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Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4678.6669	0.1366	-639.2695
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-639.2695 (269)
Total CO ₂ , kg/year			269.7089 (272)
CO ₂ emissions per m ²			2.2500 (273)
EI value			97.8096
EI rating			98 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.8750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1108 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8608 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8608 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	3.9000	3.7000	3.7000	3.3000	3.4000	3.1000	3.2000	3.5000	3.4000	3.8000 (22)
Wind factor	1.0500	0.9750	0.9750	0.9250	0.9250	0.8250	0.8500	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)
Adj infilt rate	0.9038	0.8392	0.8392	0.7962	0.7962	0.7101	0.7316	0.6671	0.6886	0.7532	0.7316	0.8177 (22b)
Effective ac	0.9084	0.8522	0.8522	0.8170	0.8170	0.7521	0.7676	0.7225	0.7371	0.7836	0.7676	0.8343 (25)

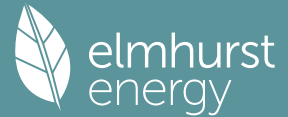
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		60.5000 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	138.6632 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 81.2023	Feb 76.1732	Mar 76.1732	Apr 73.0274	May 73.0274	Jun 67.2325	Jul 68.6191	Aug 64.5834	Sep 65.8872	Oct 70.0471	Nov 68.6191	Dec 74.5796 (38)
Heat transfer coeff	219.8655	214.8363	214.8363	211.6905	211.6905	205.8956	207.2823	203.2465	204.5504	208.7103	207.2823	213.2427 (39)
Average = Sum(39)m / 12 =												210.2608
HLP	Jan 1.8322	Feb 1.7903	Mar 1.7903	Apr 1.7641	May 1.7641	Jun 1.7158	Jul 1.7274	Aug 1.6937	Sep 1.7046	Oct 1.7393	Nov 1.7274	Dec 1.7770 (40)

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	1.7522
Days in month												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers												
81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454	(42a)
Hot water usage for baths												
31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses												
43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)												143.7856 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy content (annual)												
247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Distribution loss (46)m = 0.15 x (45)m												
37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss												
33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage												
33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss												
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(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												
304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(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												
127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(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)												
-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)												
171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583	(72)
Total internal gains												
745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589	(73)

6. Solar gains												

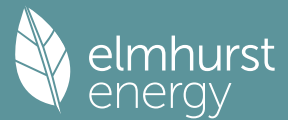
[Jan]												
	Area	Solar flux										
	m2	Table 6a	Specific data	g	Specific data	FF	Access	Gains				
		W/m2	or Table 6b		or Table 6c		factor	W				
							Table 6d					
North	1.2500	12.6907	0.6300	0.7000	0.7700			4.8481 (74)				
South	3.1500	53.4173	0.6300	0.7000	0.7700			51.4238 (78)				
North	1.2500	12.6907	0.6300	0.7000	0.7700			4.8481 (74)				
East	1.4500	23.7106	0.6300	0.7000	0.7700			10.5071 (76)				
South	2.4500	53.4173	0.6300	0.7000	0.7700			39.9963 (78)				
West	8.6500	23.7106	0.6300	0.7000	0.7700			62.6803 (80)				
North	1.5000	18.5195	0.6300	0.8000	1.0000			12.6007 (82)				

Solar gains	186.9043	293.1166	436.0512	617.8060	725.5033	806.1518	750.7118	656.5570	525.4479	354.1873	223.6333	152.7020 (83)
Total gains	932.6926	1036.4722	1156.8135	1296.4627	1361.8824	1404.3958	1326.4012	1235.7603	1126.3424	993.6799	909.5947	879.1610 (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	33.8237	34.6155	34.6155	35.1299	35.1299	36.1186	35.8770	36.5894	36.3562	35.6315	35.8770	34.8742
alpha	3.2549	3.3077	3.3077	3.3420	3.3420	3.4079	3.3918	3.4393	3.4237	3.3754	3.3918	3.3249
util living area												
0.9905	0.9862	0.9740	0.9417	0.8699	0.7142	0.5706	0.5834	0.8334	0.9530	0.9843	0.9921	(86)
MIT	18.7324	18.9457	19.3525	19.9074	20.4284	20.8141	20.9366	20.9368	20.6563	20.0402	19.3698	18.7585 (87)
Th 2	19.4475	19.4768	19.4768	19.4952	19.4952	19.5295	19.5213	19.5453	19.5375	19.5128	19.5213	19.4861 (88)
util rest of house												
0.9874	0.9815	0.9645	0.9184	0.8107	0.5880	0.3837	0.3915	0.7384	0.9287	0.9779	0.9894	(89)

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MIT 2	17.4708	17.7017	18.1032	18.6534	19.1307	19.4538	19.5093	19.5337	19.3628	18.8031	18.1544	17.5228 (90)
Living area fraction									FLA = Living area / (4) =			0.4625 (91)
MIT	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	18.0943 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	18.0943 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9764	0.9578	0.9132	0.8218	0.6404	0.4711	0.4816	0.7707	0.9257	0.9730	0.9858	(94)
Useful gains	917.0184	1011.9721	1108.0083	1183.9326	1119.1361	899.4313	624.9121	595.1286	868.1079	919.8370	885.0480	866.7171	(95)
Ext temp.	4.8000	5.2000	6.9000	9.3000	12.3000	15.1000	17.0000	17.1000	14.5000	11.2000	7.7000	4.8000	(96)
Heat loss rate W	2914.1565	2809.4212	2530.9869	2102.8019	1573.0475	1025.9686	656.9717	626.5395	1117.0532	1706.2618	2283.5367	2834.9196	(97)
Space heating kWh	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426	(98a)
Space heating requirement - total per year (kWh/year)												7808.1032	
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	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7808.1032	
Space heating per m2										(98c) / (4) =		65.0675	(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 %)													219.3000 (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	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	677.5516	550.7915	482.7616	301.6808	153.9946	0.0000	0.0000	0.0000	0.0000	266.8035	459.1481	667.7349	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(64)
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-252.6757	-345.0525	-523.8962	-611.7361	-584.5418	-385.6867	-379.8350	-384.6596	-390.5384	-421.6808	-285.3270	-207.9691	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													3560.4666 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													190.4000
Water heating fuel used													1605.2322 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													254.8716 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-4773.5990 (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													646.9715 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3560.4666	27.6700	985.1811	(240)
Total CO2 associated with community systems			0.0000	(473)

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Water heating (other fuel)	1605.2322	27.6700	444.1678 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.8716	27.6700	70.5230 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4773.5990	27.6700	-1320.8548
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-1320.8548 (252)
Total energy cost			179.0170 (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	3560.4666	0.1546	550.3551 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			776.6154 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4773.5990	0.1371	-654.6920
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-654.6920 (269)
Total CO2, kg/year			158.7093 (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	3560.4666	1.5723	5598.0522 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			8039.9173 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4773.5990	1.5071	-7194.1802
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-7194.1802 (283)
Total Primary energy kWh/year			1236.6677 (286)

SAP 10 EPC IMPROVEMENTS

EC2401D (BE GREEN)

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

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Recommended

Recommended measures: SAP change Cost change CO2 change
V2 Wind turbine + 14.6 -£ 693 -347 kg (218.8%)

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.3 -£ 15 -8 kg (4.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Wind turbine	£693 2.89 kg/m²	A 107	A 101
Total Savings	£693 2.89 kg/m²		

Potential energy efficiency rating: A 107
Potential environmental impact rating: A 101

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £1500	Potential £1500	Saving £0
Electricity			
Space heating	£985	£985	£0
Water heating	£444	£444	£0
Lighting	£71	£71	£0
Generated (PV)	-£1321	-£1321	£0
Generated (wind)	-£0	-£693	£693
Total cost of fuels	£179	-£514	£693
Total cost of uses	£179	-£514	£693
Delivered energy	5 kWh/m²	-15 kWh/m²	21 kWh/m²
Carbon dioxide emissions	0.2 tonnes	-0.2 tonnes	0.3 tonnes
CO2 emissions per m²	1 kg/m²	-2 kg/m²	3 kg/m²
Primary energy	10 kWh/m²	-21 kWh/m²	32 kWh/m²

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor	44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.8750 (5)

2. Ventilation rate

m ³ per hour												
Number of open chimneys	0	*	80	=	0.0000	(6a)						
Number of open flues	0	*	20	=	0.0000	(6b)						
Number of chimneys / flues attached to closed fire	0	*	10	=	0.0000	(6c)						
Number of flues attached to solid fuel boiler	0	*	20	=	0.0000	(6d)						
Number of flues attached to other heater	0	*	35	=	0.0000	(6e)						
Number of blocked chimneys	0	*	20	=	0.0000	(6f)						
Number of intermittent extract fans	3	*	10	=	30.0000	(7a)						
Number of passive vents	0	*	10	=	0.0000	(7b)						
Number of flueless gas fires	0	*	40	=	0.0000	(7c)						
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000	/	(5)	=	0.1108	(8)						
Pressure test	No											
Pressure Test Method	Blower Door											
Measured/design AP50	15.0000											
Infiltration rate	0.8608											
Number of sides sheltered	0											
Shelter factor	(20)	=	1	-	[0.075 x (19)]	=	1.0000	(20)				
Infiltration rate adjusted to include shelter factor	(21)	=	(18)	x	(20)	=	0.8608	(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
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
Adj infilt rate	1.0975	1.0759	1.0544	0.9468	0.9253	0.8177	0.8177	0.7962	0.8608	0.9253	0.9683	1.0114
Effective ac	1.0975	1.0759	1.0544	0.9482	0.9281	0.8343	0.8343	0.8170	0.8704	0.9281	0.9688	1.0114

3. Heat losses and heat loss parameter

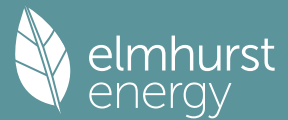
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)
Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m ²)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	78.1632	(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							60.5000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	138.6632 (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	98.1005	96.1770	94.2534	84.7621	82.9615	74.5796	74.5796	73.0274	77.8082	82.9615	86.6040	90.4063
Average = Sum(39)m / 12 =	236.7636	234.8401	232.9166	223.4252	221.6247	213.2427	213.2427	211.6905	216.4713	221.6247	225.2672	229.0695
												223.3482 (39)
HLP	1.9730	1.9570	1.9410	1.8619	1.8469	1.7770	1.7770	1.7641	1.8039	1.8469	1.8772	1.9089
HLP (average)												1.8612
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

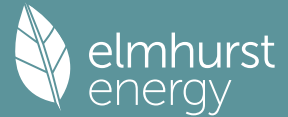
Assumed occupancy												2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532

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Average daily hot water use (litres/day)												143.7856 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769 (44)
Energy content (annual)	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2388.2662
Water storage loss (or HIU loss):	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0800 (55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Total per year (kWh/year) = Sum(64)m =												3056.3622 (64)
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	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432 (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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326 (71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583 (72)
Total internal gains	745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589 (73)
6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	or Table 6b	Specific data or Table 6c	factor Table 6d	W						
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)						
South	3.1500	46.7521	0.6300	0.7000	0.7700	45.0073 (78)						
North	1.2500	10.6334	0.6300	0.7000	0.7700	4.0621 (74)						
East	1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (76)						
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057 (78)						
West	8.6500	19.6403	0.6300	0.7000	0.7700	51.9201 (80)						
North	1.5000	15.6897	0.6300	0.8000	1.0000	10.6753 (82)						
Solar gains	159.4360	285.1826	424.5074	580.5059	697.8187	713.1348	679.1067	588.8547	478.3009	324.6144	193.4893	134.7883 (83)
Total gains	905.2243	1028.5383	1145.2697	1259.1626	1334.1978	1311.3788	1254.7961	1168.0580	1079.1954	964.1069	879.4507	861.2472 (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	31.4097	31.6669	31.9285	33.2848	33.5552	34.8742	34.8742	35.1299	34.3540	33.5552	33.0126	32.4647
alpha	3.0940	3.1111	3.1286	3.2190	3.2370	3.3249	3.3249	3.3420	3.2903	3.2370	3.2008	3.1643
util living area	0.9919	0.9873	0.9773	0.9524	0.8975	0.7839	0.6475	0.6954	0.8734	0.9645	0.9876	0.9932 (86)
MIT	18.4363	18.6736	19.0953	19.7137	20.2594	20.7077	20.8908	20.8595	20.5239	19.8210	19.0702	18.4613 (87)
Th 2	19.3514	19.3622	19.3730	19.4270	19.4374	19.4861	19.4861	19.4952	19.4673	19.4374	19.4164	19.3947 (88)
util rest of house	0.9892	0.9829	0.9690	0.9330	0.8495	0.6740	0.4660	0.5221	0.7944	0.9461	0.9826	0.9909 (89)
MIT 2	17.1130	17.3556	17.7799	18.4203	18.9389	19.3489	19.4594	19.4558	19.2041	18.5402	17.7871	17.1663 (90)
Living area fraction	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (91)
MIT	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (92)
Temperature adjustment	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (93)
adjusted MIT	17.7250	17.9652	18.3883	19.0185	19.5497	19.9773	20.1214	20.1050	19.8145	19.1326	18.3805	17.7652 (93)
8. Space heating requirement												
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	891.8568	1005.4692	1101.7118	1166.5286	1139.0961	937.3574	689.5638	701.5593	880.9327	907.4610	859.9615	850.4606 (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)

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Heat loss rate W	3178.5572	3068.2269	2768.9735	2260.7296	1739.6805	1146.6728	750.9188	784.3153	1237.0292	1891.0279	2541.1371	3107.3824 (97)
Space heating kWh	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98a)
Space heating requirement - total per year (kWh/year)												9183.9506
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	1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9183.9506
Space heating per m2												(98c) / (4) = 76.5329 (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 %)												219.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1701.3051	1386.1732	1240.4427	787.8247	446.8348	0.0000	0.0000	0.0000	0.0000	0.0000	731.7737	1210.4465	1679.1498 (98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)
Space heating fuel (main heating system)	775.7889	632.0899	565.6373	359.2452	203.7550	0.0000	0.0000	0.0000	0.0000	333.6862	551.9592	765.6862 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)
Efficiency of water heater	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-217.5657	-339.2320	-521.0176	-601.2903	-623.7809	-385.6867	-379.8350	-384.6596	-390.5384	-399.4698	-250.9147	-184.6760 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	-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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												4187.8480 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.4000
Water heating fuel used												1605.2322 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												254.8716 (232)

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

PV generation			-4678.6669 (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			-1133.5936 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4187.8480	16.4900	690.5761 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	16.4900	264.7028 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.8716	16.4900	42.0283 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4678.6669	16.4900	-771.5122
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-771.5122 (252)
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247
Wind Turbine electricity exported	0.0000	5.5900	0.0000
Total			-412.7247 (252)
Total energy cost			-186.9296 (255)

elmhurst
energy

$$\begin{array}{r} [(255) \times (256)] / [(4) + 45.0] = \\ 0.3600 \text{ (256)} \\ -0.4078 \text{ (257)} \\ 106.6112 \\ 107 \text{ (258)} \\ \text{A} \end{array}$$

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

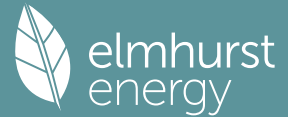
		Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling				
Ground floor		75.5000 (1b)	x 2.3500 (2b)	= 177.4250 (1b) - (3b)
First floor		44.5000 (1c)	x 2.1000 (2c)	= 93.4500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	270.8750 (5)

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000
Pressure test	Air changes per hour	
Pressure Test Method	/ (5) =	0.1108 (8)
Measured/design AP50	No	
Infiltration rate	Blower Door	
Number of sides sheltered		15.0000 (17)
		0.8608 (18)
		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8608 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	3.9000	3.7000	3.7000	3.3000	3.4000	3.1000	3.2000	3.5000	3.4000	3.8000 (22)
Wind factor	1.0500	0.9750	0.9750	0.9250	0.9250	0.8250	0.8500	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)
Adj infilt rate												
	0.9038	0.8392	0.8392	0.7962	0.7962	0.7101	0.7316	0.6671	0.6886	0.7532	0.7316	0.8177 (22b)
Effective ac	0.9084	0.8522	0.8522	0.8170	0.8170	0.7521	0.7676	0.7225	0.7371	0.7836	0.7676	0.8343 (25)

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
Main dwelling							
Front Door			2.1000	3.0000	6.3000		(26)
Windows (existing)			4.4000	1.6791	7.3881		(27)
Windows (new)			13.8000	1.3258	18.2955		(27)
Roof Windows			1.5000	1.3258	1.9886		(27a)
Ground Floor			75.5000	0.1800	13.5900	110.0000	8305.0000 (28a)

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Wall (masonry)	103.0000	20.3000	82.7000	0.1800	14.8860	190.0000	15713.0000 (29a)
Wall (ashlar)	35.5000		35.5000	0.1100	3.9050	9.0000	319.5000 (29a)
Roof (pitched)	57.5000	1.5000	56.0000	0.1500	8.4000	9.0000	504.0000 (30)
Roof (ceiling)	31.0000		31.0000	0.1100	3.4100	9.0000	279.0000 (30)
Total net area of external elements Aum(A, m2)			302.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.1632		(33)
Main dwelling							
Internal Wall			50.0000			9.0000	450.0000 (32c)
Internal Floor			44.5000			18.0000	801.0000 (32d)
Internal Ceiling			44.5000			9.0000	400.5000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 26772.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 223.1000 (35)
Thermal bridges (Default value 0.200 * total exposed area) 60.5000 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 138.6632 (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	81.2023	76.1732	76.1732	73.0274	73.0274	67.2325	68.6191	64.5834	65.8872	70.0471	68.6191	74.5796	(38)
Heat transfer coeff	219.8655	214.8363	214.8363	211.6905	211.6905	205.8956	207.2823	203.2465	204.5504	208.7103	207.2823	213.2427	(39)
Average = Sum(39)m / 12 =												210.2608	
HLP	1.8322	1.7903	1.7903	1.7641	1.7641	1.7158	1.7274	1.6937	1.7046	1.7393	1.7274	1.7770	(40)
HLP (average)												1.7522	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8633 (42)
Hot water usage for mixer showers	81.2567	80.0356	78.2562	74.8515	72.3390	69.5371	67.9445	69.7104	71.6463	74.6547	78.1324	80.9454	(42a)
Hot water usage for baths	31.1837	30.7206	30.0684	28.8659	27.9655	26.9671	26.4278	27.0754	27.7806	28.8489	30.0761	31.0783	(42b)
Hot water usage for other uses	43.9532	42.3549	40.7566	39.1583	37.5600	35.9617	35.9617	37.5600	39.1583	40.7566	42.3549	43.9532	(42c)
Average daily hot water use (litres/day)												143.7856	(43)
Daily hot water use	156.3936	153.1111	149.0812	142.8758	137.8646	132.4659	130.3340	134.3459	138.5851	144.2602	150.5635	155.9769	(44)
Energy conte	247.6893	218.0281	229.1322	195.5898	185.5922	162.8823	157.6277	166.3482	170.8893	195.7597	214.5053	244.2221	(45)
Energy content (annual)										Total = Sum(45)m =		2388.2662	
Distribution loss (46)m = 0.15 x (45)m	37.1534	32.7042	34.3698	29.3385	27.8388	24.4323	23.6442	24.9522	25.6334	29.3640	32.1758	36.6333	(46)
Water storage loss (or HIU loss):													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645	(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	127.7506	113.4953	121.5804	108.9632	107.1033	98.0880	97.8051	100.7047	100.7503	110.4840	115.2526	126.5978	(65)

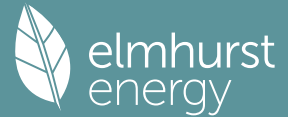
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	171.7989	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0797	32.0457	26.0613	19.7301	14.7485	12.4513	13.4540	17.4881	23.4725	29.8037	34.7853	37.0825	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.6913	430.1086	418.9771	395.2793	365.3651	337.2500	318.4674	314.0500	325.1816	348.8794	378.7936	406.9087	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	55.0432	(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)	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	-114.5326	(71)
Water heating gains (Table 5)	171.7078	168.8918	163.4145	151.3378	143.9561	136.2333	131.4585	135.3558	139.9310	148.5000	160.0731	170.1583	(72)
Total internal gains	745.7883	743.3557	720.7624	678.6567	636.3791	598.2440	575.6894	579.2034	600.8945	639.4926	685.9614	726.4589	(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	1.2500	12.6907	0.6300	0.7000	0.7700	4.8481	(74)
South	3.1500	53.4173	0.6300	0.7000	0.7700	51.4238	(78)
North	1.2500	12.6907	0.6300	0.7000	0.7700	4.8481	(74)

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East			1.4500		23.7106		0.6300		0.7000		0.7700		10.5071 (76)
South			2.4500		53.4173		0.6300		0.7000		0.7700		39.9963 (78)
West			8.6500		23.7106		0.6300		0.7000		0.7700		62.6803 (80)
North			1.5000		18.5195		0.6300		0.8000		1.0000		12.6007 (82)

Solar gains	186.9043	293.1166	436.0512	617.8060	725.5033	806.1518	750.7118	656.5570	525.4479	354.1873	223.6333	152.7020 (83)
Total gains	932.6926	1036.4722	1156.8135	1296.4627	1361.8824	1404.3958	1326.4012	1235.7603	1126.3424	993.6799	909.5947	879.1610 (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	33.8237	34.6155	34.6155	35.1299	35.1299	36.1186	35.8770	36.5894	36.3562	35.6315	35.8770	34.8742	
alpha	3.2549	3.3077	3.3077	3.3420	3.3420	3.4079	3.3918	3.4393	3.4237	3.3754	3.3918	3.3249	
util living area	0.9905	0.9862	0.9740	0.9417	0.8699	0.7142	0.5706	0.5834	0.8334	0.9530	0.9843	0.9921 (86)	
MIT	18.7324	18.9457	19.3525	19.9074	20.4284	20.8141	20.9366	20.9368	20.6563	20.0402	19.3698	18.7585 (87)	
Th 2	19.4475	19.4768	19.4768	19.4952	19.4952	19.5295	19.5213	19.5453	19.5375	19.5128	19.5213	19.4861 (88)	
util rest of house	0.9874	0.9815	0.9645	0.9184	0.8107	0.5880	0.3837	0.3915	0.7384	0.9287	0.9779	0.9894 (89)	
MIT 2	17.4708	17.7017	18.1032	18.6534	19.1307	19.4538	19.5093	19.5337	19.3628	18.8031	18.1544	17.5228 (90)	
Living area fraction												0.4625 (91)	
MIT	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	18.0943 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.0543	18.2770	18.6810	19.2334	19.7309	20.0830	20.1695	20.1827	19.9610	19.3753	18.7166	18.0943 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9764	0.9578	0.9132	0.8218	0.6404	0.4711	0.4816	0.7707	0.9257	0.9730	0.9858 (94)	
Useful gains	917.0184	1011.9721	1108.0083	1183.9326	1119.1361	899.4313	624.9121	595.1286	868.1079	919.8370	885.0480	866.7171 (95)	
Ext temp.	4.8000	5.2000	6.9000	9.3000	12.3000	15.1000	17.0000	17.1000	14.5000	11.2000	7.7000	4.8000 (96)	
Heat loss rate W	2914.1565	2809.4212	2530.9869	2102.8019	1573.0475	1025.9686	656.9717	626.5395	1117.0532	1706.2618	2283.5367	2834.9196 (97)	
Space heating kWh	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426 (98a)	
Space heating requirement - total per year (kWh/year)												7808.1032	
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	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												7808.1032	
Space heating per m2										(98c) / (4) =		65.0675 (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 %)													219.3000 (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	1485.8707	1207.8858	1058.6961	661.5859	337.7101	0.0000	0.0000	0.0000	0.0000	585.1001	1006.9119	1464.3426 (98)	
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000 (210)	
Space heating fuel (main heating system)	677.5516	550.7915	482.7616	301.6808	153.9946	0.0000	0.0000	0.0000	0.0000	266.8035	459.1481	667.7349 (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	304.4317	269.2793	285.8746	250.5018	242.3346	217.7943	214.3701	223.0906	225.8013	252.5021	269.4173	300.9645 (64)	
Efficiency of water heater (217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000 (216)	
Fuel for water heating, kWh/month	159.8906	141.4282	150.1442	131.5661	127.2766	114.3878	112.5893	117.1695	118.5931	132.6166	141.5007	158.0696 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	31.5804	25.3349	22.8113	16.7125	12.9092	10.5470	11.7762	15.3072	19.8826	26.0870	29.4652	32.4581 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-252.6757	-345.0525	-523.8962	-611.7361	-584.5418	-385.6867	-379.8350	-384.6596	-390.5384	-421.6808	-285.3270	-207.9691 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												3560.4666 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												190.4000	

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Water heating fuel used	1605.2322 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	254.8716 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4773.5990 (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	-1855.9071 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3560.4666	27.6700	985.1811 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	27.6700	444.1678 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	254.8716	27.6700	70.5230 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4773.5990	27.6700	-1320.8548
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-1320.8548 (252)
Wind Turbine electricity used in dwelling	-2502.8785	27.6700	-692.5465
Wind Turbine electricity exported	0.0000	5.8100	0.0000
Total			-692.5465 (252)
Total energy cost			-513.5295 (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	3560.4666	0.1546	550.3551 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1605.2322	0.1410	226.2603 (264)
Space and water heating			776.6154 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	254.8716	0.1443	36.7859 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4773.5990	0.1371	-654.6920
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-654.6920 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-347.1801 (269)
Total CO2, kg/year			-188.4708 (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	3560.4666	1.5723	5598.0522 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1605.2322	1.5212	2441.8651 (278)
Space and water heating			8039.9173 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	254.8716	1.5338	390.9306 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4773.5990	1.5071	-7194.1802
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-7194.1802 (283)
Wind Turbine electricity used in dwelling	-2502.8785	1.5128	-3786.3546
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-3786.3546 (283)
Total Primary energy kWh/year			-2549.6869 (286)

Part G Compliance Report

PROJECT DETAILS

Project Reference: EC2401G
Client: Mr & Mrs Owen
Property: 2 Bedroom Dwelling
Hopelands Farm, Polecat Lane
Copsale RH13 6QR

Local Authority: Horsham District Council
Agent: KG Designs

Assessor: Joe Solti
Address: Therm Energy Ltd
Contact: 01903 884357
Software: G-Calc 2015 version 3.0.2
Prepared on: 06-May-26

RESULT SUMMARY

By following the Government's national calculation methodology for assessing water efficiency in new dwellings this 2 bed dwelling, as designed, achieves a water consumption of 110 litres per person per day.

Compliance with Building Regulation 36(1) has been demonstrated.

Table 1: The Water Calculator for New Dwellings					
Installation Type	Unit of measure	Value	Use factor	Fixed use	litres/person/day
WC(single flush)	Flush volume (litres)		4.42	0.00	0
WC(dual flush)	Full flush vol.	6	1.46	0.00	8.76
	Part flush vol.	3	2.96	0.00	8.88
WC(multiple fittings)	Average effective Flush vol. (litres)		4.42	0.00	0
Taps(excl. Kitchen)	Flow rate (litres/min)	6	1.58	1.58	11.06
Bath (shower also present)	Capacity to overflow (litres)	180	0.11	0.00	19.8
Shower (bath also present)	Flow rate (litres/min)	8	4.37	0.00	34.96
Bath only	Capacity to overflow (litres)	0	0.50	0.00	0
Shower only	Flow rate (litres/minute)	0	5.6	0.00	0
Kitchen sink taps	Flow rate (litres/minute)	6	0.44	10.36	13
Washing Machine	litres/kg dry load	7.1	2.1	0.0	14.91
Dishwasher	litres/place setting	1.1	3.6	0.0	3.96
Waste disposal	litres/use	0	3.08	0.0	0
Water softener	litres/person/day	0	1.0	0.0	0
Total calculated use (litres/person/day)					115.33
Contribution from greywater (litres/person/day)					-
Contribution from rainwater (litres/person/day)					-
Normalisation factor					0.91
Total Water Consumption. Code for Sustainable Homes (litres/person/day)					105
External water use					5.0
Total Water Consumption. (36(1)) (litres/person/day)					110

Summary of fitting types "As Designed"			
Type	Description	Flow rates, volumes etc.	Qty
Taps	Taps	6 litres/min	1
Baths	Baths	180 litres to overflow	1
Dishwashers	Dishwasher	1.1 litres/place	1
Washing Machines	Washing Machine	7.1 litres/kg	1
Showers	Showers	8 litres/min	1
WC's	Toilets	6 / 3 litres flush vols.	1
Kitchen/Utility taps	Taps	6 litres/min	1

The lower section of this table is to be filled in by the builder prior to completion. The descriptions, values and quantities should represent the 'as built' specification. Please note the values above represent design values and should not be exceeded without prior consultation with the agent/designer (KG Designs).
The completed table should be returned to the assessor: Joe Solti (Contact: 01903 884357).

Declaration of fitting types "As Built"			
Type	Make and Model	Flow rates, volumes etc.	Qty
Taps			
Baths			
Dishwashers			
Washing Machines			
Showers			
WC's			
Kitchen/Utility taps			

Project ref: EC2401G - 2 Bedroom Dwelling

The above declaration of fittings, values and quantities is a true reflection of those installed on this project.

Name: Signature: Date:

-----End of Report-----