

Full SAP Calculation Printout



Plot Reference	Finchampstead Rd - Plot 4			Issued on Date	14/12/2025
Assessment Reference	Plot 4	Plot Type Ref			
Plot Address	Plot 4, 58, Finchampstead Road, Wokingham, RG40 2NS			SAP Version	10.2
SAP Rating	82 B	DER	3.29	TER	7.34
Environmental	96 A	% DER < TER			55.18
CO ₂ Emissions (t/year)	0.97	DFEE	38.63	TFEE	40.06
Compliance Check	See BREL	% DFEE < TFEE			3.56
% DPER < TPER	13.15	DPER	34.06	TPER	39.22
Assessor Details	Mr. Steven Leahy			Assessor ID	A593-0001
Client	0864, Harding Rose Architects				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	122.4200 (1b)	x 2.4500 (2b)	= 299.9290 (1b) - (3b)
First floor	142.6500 (1c)	x 3.0000 (2c)	= 427.9500 (1c) - (3c)
Second floor	54.9600 (1d)	x 3.0000 (2d)	= 164.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	320.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 892.7590 (5)

2. Ventilation rate

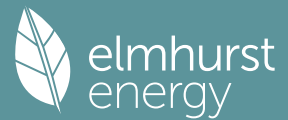
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	8 * 10 = 80.0000 (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) =	80.0000 / (5) = 0.0896 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3396 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2887 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3681	0.3608	0.3536	0.3175	0.3103	0.2742	0.2742	0.2670	0.2887	0.3103	0.3248	0.3392 (22b)
Effective ac	0.5677	0.5651	0.5625	0.5504	0.5481	0.5376	0.5376	0.5356	0.5417	0.5481	0.5527	0.5575 (25)

3. Heat losses and heat loss parameter

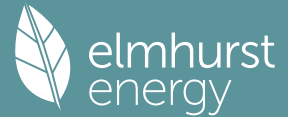
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Entrance Door			3.7800	1.4000	5.2920		(26a)
Windows			36.3600	1.3258	48.2045		(27)
Roof Windows			1.9200	1.3258	2.5455		(27a)
House to Garage Door			1.8900	1.4000	2.6460		(26)
Ground Floor			122.4200	0.1200	14.6904	110.0000	13466.2000 (28a)
Above Garage			30.3300	0.1800	5.4594	20.0000	606.6000 (28b)
Cavity Wall	239.3700	34.3500	205.0200	0.1700	34.8534	60.0000	12301.2000 (29a)
Stud / Timber Walls	96.6600	7.6800	88.9800	0.1700	15.1266	9.0000	800.8200 (29a)
Slope Roof	51.2400	1.9200	49.3200	0.1400	6.9048	9.0000	443.8800 (30)
Flat Ceilings	51.1700		51.1700	0.1400	7.1638	9.0000	460.5300 (30)
Between 1st & 2nd Floors	87.6900		87.6900	0.1400	12.2766	9.0000	789.2100 (30)
Dormer Roofs	7.2000		7.2000	0.1400	1.0080	9.0000	64.8000 (30)
Total net area of external elements A _{um} (A, m ²)			686.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	156.1710		(33)
Main dwelling							
Internal Walls			535.8600			9.0000	4822.7400 (32c)
First Floor			122.4200			18.0000	2203.5600 (32d)
Second Floor			54.9600			18.0000	989.2800 (32d)

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Ground Floor Ceiling	122.4200	9.0000	1101.7800 (32e)
First Floor Ceiling	54.8600	9.0000	493.7400 (32e)
Heat capacity Cm = Sum(A x k)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			
List of Thermal Bridges			
(28)...(30) + (32) + (32a)...(32e) = 38544.3400 (34)			
120.4398 (35)			
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	27.9000	0.0380	1.0602
E4 Jamb	59.0000	0.0160	0.9440
E16 Corner (normal)	80.8500	0.0390	3.1531
E10 Eaves (insulation at ceiling level)	74.0000	0.0610	4.5140
E11 Eaves (insulation at rafter level)	43.7000	0.0100	0.4370
E17 Corner (inverted - internal area greater than external area)	54.2500	-0.0910	-4.9367
E14 Flat roof	16.8000	0.1600	2.6880
E3 Sill	25.2000	0.0210	0.5292
E5 Ground floor (normal)	48.6000	0.0370	1.7982
E6 Intermediate floor within a dwelling	59.4300	0.0030	0.1783
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			
Point Thermal bridges			
Total fabric heat loss			
(33) + (36) + (36a) = 169.2243 (37)			
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)			
(38)m	Jan	Feb	Mar
Heat transfer coeff	167.2596	166.4847	165.7252
Average = Sum(39)m / 12 =	336.4838	335.7090	334.9495
Days in month			
HLP			
HLP (average)			
Days in month			
4. Water heating energy requirements (kWh/year)			
Assumed occupancy			
Hot water usage for mixer showers			
Hot water usage for baths			
Hot water usage for other uses			
Average daily hot water use (litres/day)			
Daily hot water use			
Energy content (annual)			
Distribution loss (46)m = 0.15 x (45)m			
Water storage loss (or HIU loss):			
Store volume			
a) If manufacturer declared loss factor is known (kWh/day):			
Temperature factor from Table 2b			
Enter (49) or (54) in (55)			
Total storage loss			
If cylinder contains dedicated solar storage			
Primary loss			
Combi loss			
Total heat required for water heating calculated for each month			
WWHRS			
PV diverter			
Solar input			
FGHRS			
Output from w/h			
12Total per year (kWh/year)			
Electric shower(s)			
Heat gains from water heating, kWh/month			
5. Internal gains (see Table 5 and 5a)			
Metabolic gains (Table 5), Watts			
(66)m			
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5			
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5			
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5			
Pumps, fans			
Losses e.g. evaporation (negative values) (Table 5)			
Water heating gains (Table 5)			
Total internal gains			
6. Solar gains			

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[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	1.4400		11.2829		0.7600		0.7000		0.7700		5.9900 (75)	
East	4.3200		19.6403		0.7600		0.7000		0.7700		31.2807 (76)	
South	26.5200		46.7521		0.7600		0.7000		0.7700		457.1084 (78)	
West	2.6400		19.6403		0.7600		0.7000		0.7700		19.1160 (80)	
Northwest	1.4400		11.2829		0.7600		0.7000		0.7700		5.9900 (81)	
North	0.4800		15.2954		0.7600		0.7000		1.0000		3.5153 (82)	
East	0.9600		25.9287		0.7600		0.7000		1.0000		11.9181 (82)	
West	0.4800		25.9287		0.7600		0.7000		1.0000		5.9590 (82)	
Solar gains	540.8775	913.9104	1232.3923	1499.3480	1656.0609	1634.3288	1579.6901	1463.9312	1324.8528	1005.0411	646.4593	463.7972 (83)
Total gains	1545.0318	1948.1169	2219.3121	2454.2719	2560.0294	2506.6006	2416.4405	2300.3636	2187.9411	1895.9131	1593.3183	1445.1622 (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	31.8195	31.8930	31.9653	32.3094	32.3746	32.6817	32.6817	32.7392	32.5627	32.3746	32.2430	32.1065
alpha	3.1213	3.1262	3.1310	3.1540	3.1583	3.1788	3.1788	3.1826	3.1708	3.1583	3.1495	3.1404
util living area	0.9871	0.9733	0.9513	0.9052	0.8241	0.6890	0.5439	0.5835	0.7738	0.9253	0.9767	0.9894 (86)
Living	19.1045	19.3604	19.6949	20.1137	20.4762	20.7396	20.8469	20.8315	20.6484	20.1588	19.5536	19.0652
Non living	17.7882	18.1148	18.5396	19.0688	19.5077	19.8075	19.9072	19.8973	19.7140	19.1338	18.3699	17.7435
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0
16 / 9	21	28	2	0	0	0	0	0	0	0	0	31
MIT	20.2727	20.0714	19.7315	20.1137	20.4762	20.7396	20.8469	20.8315	20.6484	20.1588	19.5536	19.9042 (87)
Th 2	20.0407	20.0427	20.0447	20.0539	20.0556	20.0636	20.0636	20.0651	20.0605	20.0556	20.0521	20.0485 (88)
util rest of house	0.9848	0.9686	0.9426	0.8870	0.7877	0.6214	0.4461	0.4875	0.7169	0.9074	0.9720	0.9876 (89)
MIT 2	19.3672	19.1918	18.5938	19.0688	19.5077	19.8075	19.9072	19.8973	19.7140	19.1338	18.3699	19.0311 (90)
Living area fraction									fLA =	Living area / (4) =		0.0761 (91)
MIT	19.4361	19.2587	18.6804	19.1483	19.5814	19.8785	19.9788	19.9684	19.7851	19.2118	18.4600	19.0976 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4361	19.2587	18.6804	19.1483	19.5814	19.8785	19.9788	19.9684	19.7851	19.2118	18.4600	19.0976 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9830	0.9641	0.9263	0.8656	0.7663	0.6065	0.4365	0.4767	0.6974	0.8867	0.9606	0.9852 (94)
Useful gains	1518.8394	1878.1055	2055.6646	2124.3103	1961.7596	1520.1667	1054.7646	1096.5508	1525.9316	1681.0420	1530.5983	1423.8244 (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	5093.0667	4820.3563	4079.8166	3396.1178	2606.4936	1729.2650	1106.9078	1166.9914	1869.2963	2848.0556	3772.2520	4967.9874 (97)
Space heating kWh	2659.2251	1977.1925	1505.9691	915.7014	479.6820	0.0000	0.0000	0.0000	0.0000	868.2581	1613.9907	2636.8572 (98a)
Space heating requirement - total per year (kWh/year)												12656.8762
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	2659.2251	1977.1925	1505.9691	915.7014	479.6820	0.0000	0.0000	0.0000	0.0000	868.2581	1613.9907	2636.8572 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12656.8762
Space heating per m2										(98c) / (4) =		39.5490 (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 %)												296.5298 (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	2659.2251	1977.1925	1505.9691	915.7014	479.6820	0.0000	0.0000	0.0000	0.0000	868.2581	1613.9907	2636.8572 (98)
Space heating efficiency (main heating system 1)	296.5298	296.5298	296.5298	296.5298	296.5298	0.0000	0.0000	0.0000	0.0000	296.5298	296.5298	296.5298 (210)
Space heating fuel (main heating system)	896.7816	666.7769	507.8643	308.8058	161.7652	0.0000	0.0000	0.0000	0.0000	292.8063	544.2928	889.2384 (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	353.2714	312.4646	331.4464	289.5074	279.4918	250.5344	246.0032	256.3043	259.7648	291.2871	311.8177	349.1041 (64)
Efficiency of water heater (217)m	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788 (217)
Fuel for water heating, kWh/month	219.7252	194.3445	206.1506	180.0657	173.8363	155.8255	153.0073	159.4143	161.5666	181.1726	193.9421	217.1332 (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	67.6141	54.2426	48.8394	35.7819	27.6389	22.5812	25.2132	32.7730	42.5689	55.8527	63.0855	69.4933 (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)												

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(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												4268.3313	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												160.7788	
Water heating fuel used												2196.1838	(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)												545.6848	(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												7010.2000	(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	4268.3313	0.1553	663.0309	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2196.1838	0.1410	309.7130	(264)
Space and water heating			972.7439	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	545.6848	0.1443	78.7592	(268)
Total CO2, kg/year			1051.5031	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2900	(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	4268.3313	1.5751	6722.8960	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2196.1838	1.5215	3341.4040	(278)
Space and water heating			10064.3000	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	545.6848	1.5338	836.9896	(282)
Total Primary energy kWh/year			10901.2895	(286)
Dwelling Primary energy Rate (DPER)			34.0600	(287)

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

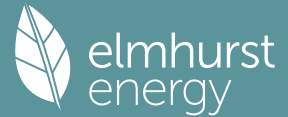
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	122.4200 (1b)	x 2.4500 (2b)	= 299.9290 (1b) - (3b)	
First floor	142.6500 (1c)	x 3.0000 (2c)	= 427.9500 (1c) - (3c)	
Second floor	54.9600 (1d)	x 3.0000 (2d)	= 164.8800 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	320.0300			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 892.7590	(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	Air changes per hour	
Pressure test	40.0000 / (5) =	0.0448 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
		0.2948 (18)

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Number of sides sheltered

2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.2506 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.3195	0.3132	0.3070	0.2756	0.2694	0.2381	0.2381	0.2318	0.2506	0.2694	0.2819	0.2944	(22b)
	0.5510	0.5491	0.5471	0.5380	0.5363	0.5283	0.5283	0.5269	0.5314	0.5363	0.5397	0.5433	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Semi-glazed door			3.7800	1.0000	3.7800			(26a)
TER Opening Type			36.3600	1.1450	41.6336			(27)
TER Roof Window			1.9200	1.1450	2.7170			(27a)
Ground Floor			122.4200	0.1300	15.9146			(28a)
Above Garage			30.3300	0.1300	3.9429			(28b)
Cavity Wall	239.3700	34.3500	205.0200	0.1800	36.9036			(29a)
Stud / Timber Walls	96.6600	7.6800	88.9800	0.1800	16.0164			(29a)
Slope Roof	51.2400	1.9200	49.3200	0.1100	5.4252			(30)
Flat Ceilings	51.1700		51.1700	0.1100	5.6287			(30)
Between 1st & 2nd Floors	87.6900		87.6900	0.1100	9.6459			(30)
Dormer Roofs	7.2000		7.2000	0.1100	0.7920			(30)
Total net area of external elements Aum (A, m2)			686.0800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	144.2899		(33)

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

120.4398 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	27.9000	0.0500	1.3950	
E2 Other lintels (including other steel lintels)	59.0000	0.0500	2.9500	
E4 Jamb	80.8500	0.0900	7.2765	
E16 Corner (normal)	74.0000	0.0600	4.4400	
E10 Eaves (insulation at ceiling level)	43.7000	0.0400	1.7480	
E11 Eaves (insulation at rafter level)	54.2500	-0.0900	-4.8825	
E17 Corner (inverted - internal area greater than external area)	16.8000	0.0800	1.3440	
E14 Flat roof	25.2000	0.0500	1.2600	
E3 Sill	48.6000	0.1600	7.7760	
E5 Ground floor (normal)	59.4300	0.0000	0.0000	
E6 Intermediate floor within a dwelling	2.4000	0.0800	0.1920	
R1 Head of roof window	2.4000	0.0600	0.1440	
R2 Sill of roof window	6.4000	0.0800	0.5120	
R3 Jamb of roof window				

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

24.1550 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

$$(33) + (36) + (36a) = 168.4449 \quad (37)$$

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

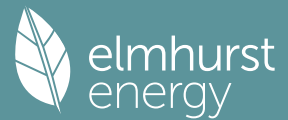
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	162.3417	161.7578	161.1855	158.4973	157.9944	155.6530	155.6530	155.2195	156.5549	157.9944	159.0118	160.0755	(38)
Heat transfer coeff	330.7866	330.2027	329.6304	326.9422	326.4392	324.0979	324.0979	323.6643	324.9998	326.4392	327.4567	328.5204	(39)
Average = Sum(39)m / 12 =												326.9398	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0336	1.0318	1.0300	1.0216	1.0200	1.0127	1.0127	1.0114	1.0155	1.0200	1.0232	1.0265	(40)
HLP (average)												1.0216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1580 (42)
Hot water usage for mixer showers	77.1687	76.0090	74.3191	71.0857	68.6996	66.0387	64.5262	66.2033	68.0417	70.8988	74.2016	76.8730	(42a)
Hot water usage for baths	33.3083	32.8136	32.1170	30.8326	29.8708	28.8044	28.2284	28.9201	29.6733	30.8144	32.1252	33.1957	(42b)
Hot water usage for other uses	46.9708	45.2627	43.5547	41.8467	40.1386	38.4306	38.4306	40.1386	41.8467	43.5547	45.2627	46.9708	(42c)
Average daily hot water use (litres/day)												144.7296	(43)
Daily hot water use	157.4477	154.0853	149.9908	143.7650	138.7091	133.2737	131.1851	135.2620	139.5616	145.2679	151.5895	157.0394	(44)
Energy conte	249.3587	219.4154	230.5302	196.8071	186.7291	163.8755	158.6571	167.4826	172.0935	197.1271	215.9671	245.8858	(45)
Energy content (annual)										Total = Sum(45)m =		2403.9291	
Distribution loss (46)m = 0.15 x (45)m	37.4038	32.9123	34.5795	29.5211	28.0094	24.5813	23.7986	25.1224	25.8140	29.5691	32.3951	36.8829	(46)
Water storage loss (or HIU loss):													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage													
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	(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	304.2655	269.0086	285.4370	249.9427	241.6359	217.0111	213.5638	222.3894	225.2291	252.0339	269.1027	300.7926	(62)
WWHRS	-35.2783	-31.2004	-32.6713	-27.0531	-25.2125	-21.5745	-20.2227	-21.5048	-22.3218	-26.3150	-29.8117	-34.6250	(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	268.9872	237.8082	252.7657	222.8896	216.4234	195.4366	193.3412	200.8846	202.9072	225.7189	239.2910	266.1676	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2722.6212	(64)
Electric shower(s)												2723	(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	126.8372	112.6302	120.5767	107.9468	106.0129	96.9971	96.6789	99.6134	99.7296	109.4702	114.3175	125.6825 (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
	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	265.1194	293.5251	265.1194	273.9567	265.1194	273.9567	265.1194	265.1194	273.9567	265.1194	273.9567	265.1194 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	474.2892	479.2108	466.8085	440.4053	407.0760	375.7512	354.8243	349.9027	362.3051	388.7082	422.0375	453.3623 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188 (71)
Water heating gains (Table 5)	170.4801	167.6045	162.0655	149.9262	142.4904	134.7182	129.9448	133.8890	138.5133	147.1374	158.7744	168.9280 (72)
Total internal gains	983.2582	1013.7099	967.3629	937.6577	888.0554	854.7957	820.2580	819.2806	845.1446	874.3345	928.1381	960.7793 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				1.4400	11.2829	0.6300		0.7000		0.7700		4.9654 (75)
East				4.3200	19.6403	0.6300		0.7000		0.7700		25.9300 (76)
South				26.5200	46.7521	0.6300		0.7000		0.7700		378.9188 (78)
West				2.6400	19.6403	0.6300		0.7000		0.7700		15.8461 (80)
Northwest				1.4400	11.2829	0.6300		0.7000		0.7700		4.9654 (81)
North				0.4800	15.2954	0.6300		0.7000		1.0000		2.9140 (82)
East				0.9600	25.9287	0.6300		0.7000		1.0000		9.8795 (82)
West				0.4800	25.9287	0.6300		0.7000		1.0000		4.9397 (82)
Solar gains	448.3590	757.5836	1021.5883	1242.8806	1372.7873	1354.7725	1309.4800	1213.5219	1098.2332	833.1261	535.8807	384.4635 (83)
Total gains	1431.6172	1771.2935	1988.9513	2180.5383	2260.8427	2209.5682	2129.7380	2032.8026	1943.3778	1707.4607	1464.0188	1345.2427 (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	32.3676	32.4248	32.4811	32.7482	32.7986	33.0356	33.0356	33.0798	32.9439	32.7986	32.6967	32.5909
util living area	3.1578	3.1617	3.1654	3.1832	3.1866	3.2024	3.2024	3.2053	3.1963	3.1866	3.1798	3.1727
	0.9895	0.9791	0.9626	0.9265	0.8592	0.7374	0.5944	0.6335	0.8131	0.9411	0.9814	0.9914 (86)
MIT	18.5825	18.8906	19.3118	19.8563	20.3537	20.7364	20.9051	20.8808	20.6079	19.9430	19.1606	18.5310 (87)
Th 2	20.0554	20.0569	20.0584	20.0654	20.0667	20.0728	20.0728	20.0739	20.0704	20.0667	20.0640	20.0613 (88)
util rest of house	0.9877	0.9755	0.9557	0.9117	0.8275	0.6728	0.4938	0.5363	0.7611	0.9263	0.9775	0.9899 (89)
MIT 2	17.1872	17.5805	18.1164	18.8050	19.4141	19.8544	20.0166	19.9987	19.7200	18.9223	17.9317	17.1249 (90)
Living area fraction	17.2934	17.6803	18.2074	18.8850	19.4856	19.9215	20.0842	20.0658	19.7876	19.0000	18.0252	17.2320 (91)
MIT	17.2934	17.6803	18.2074	18.8850	19.4856	19.9215	20.0842	20.0658	19.7876	19.0000	18.0252	17.2320 (92)
Temperature adjustment												0.0000
adjusted MIT	17.2934	17.6803	18.2074	18.8850	19.4856	19.9215	20.0842	20.0658	19.7876	19.0000	18.0252	17.2320 (93)

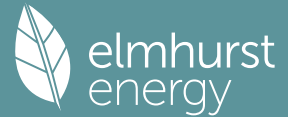
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9791	0.9617	0.9365	0.8873	0.8036	0.6608	0.4951	0.5354	0.7423	0.9033	0.9647	0.9824 (94)
Useful gains	1401.6449	1703.4109	1862.7162	1934.6905	1816.8817	1460.0876	1054.4788	1088.3565	1442.5444	1542.3466	1412.3068	1321.6210 (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	4298.0587	4220.0751	3859.1074	3264.5123	2541.5318	1724.7015	1129.2199	1186.4985	1848.4686	2742.0763	3577.5390	4281.2670 (97)
Space heating kWh	2154.9319	1691.1983	1485.3151	957.4717	539.1397	0.0000	0.0000	0.0000	0.0000	892.5989	1558.9672	2201.9767 (98a)
Space heating requirement - total per year (kWh/year)												11481.5995
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	2154.9319	1691.1983	1485.3151	957.4717	539.1397	0.0000	0.0000	0.0000	0.0000	892.5989	1558.9672	2201.9767 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11481.5995
Space heating per m2										(98c) / (4) =		35.8766 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	2154.9319	1691.1983	1485.3151	957.4717	539.1397	0.0000	0.0000	0.0000	0.0000	892.5989	1558.9672	2201.9767 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)

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Space heating fuel (main heating system)	2334.7041	1832.2842	1609.2255	1037.3475	584.1166	0.0000	0.0000	0.0000	0.0000	967.0628	1689.0219	2385.6735	(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	268.9872	237.8082	252.7657	222.8896	216.4234	195.4366	193.3412	200.8846	202.9072	225.7189	239.2910	266.1676	(64)
Efficiency of water heater	87.7023	87.5823	87.3670	86.9483	86.0211	79.8000	79.8000	79.8000	79.8000	86.8236	87.4870	79.8000	(216)
Fuel for water heating, kWh/month	306.7046	271.5255	289.3148	256.3473	251.5935	244.9080	242.2822	251.7351	254.2697	259.9742	273.5160	303.3839	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	55.0866	44.1925	39.7904	29.1522	22.5180	18.3974	20.5417	26.7008	34.6817	45.5043	51.3970	56.6176	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-123.8345	-163.4379	-219.8715	-230.5524	-235.0091	-214.2000	-211.0888	-205.4555	-194.2621	-178.1185	-131.9025	-108.3744	(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)	-108.1236	-221.6883	-430.6629	-633.1582	-824.7169	-824.6126	-815.2967	-696.2364	-518.0868	-312.7738	-142.8542	-85.9879	(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												12439.4360	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												3205.5547	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												444.5802	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-7830.3054	(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												8345.2656	(238)

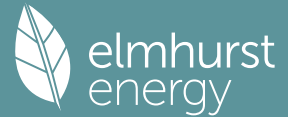
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	12439.4360	0.2100	2612.2816 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3205.5547	0.2100	673.1665 (264)
Space and water heating			3285.4481 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	444.5802	0.1443	64.1667 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2216.1071	0.1361	-301.6179
PV Unit electricity exported	-5614.1983	0.1265	-710.3412
Total			-1011.9591 (269)
Total CO2, kg/year			2349.5849 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.3400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	12439.4360	1.1300	14056.5627 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3205.5547	1.1300	3622.2769 (278)
Space and water heating			17678.8396 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	444.5802	1.5338	681.9120 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2216.1071	1.5031	-3331.0202
PV Unit electricity exported	-5614.1983	0.4645	-2607.5913
Total			-5938.6115 (283)
Total Primary energy kWh/year			12552.2409 (286)
Target Primary Energy Rate (TPER)			39.2200 (287)

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	122.4200 (1b)	x 2.4500 (2b)	= 299.9290 (1b) - (3b)
First floor	142.6500 (1c)	x 3.0000 (2c)	= 427.9500 (1c) - (3c)
Second floor	54.9600 (1d)	x 3.0000 (2d)	= 164.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	320.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	892.7590 (5)

2. Ventilation rate

												m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)											
Number of blocked chimneys	0 * 20 = 0.0000 (6f)											
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)											
Number of passive vents	0 * 10 = 0.0000 (7b)											
Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
												Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =											0.0448 (8)
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	5.0000 (17)											
Infiltration rate	0.2948 (18)											
Number of sides sheltered	2 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.2506 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3195	0.3132	0.3070	0.2756	0.2694	0.2381	0.2381	0.2318	0.2506	0.2694	0.2819	0.2944 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)											
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)											
Effective ac	0.5510	0.5491	0.5471	0.5380	0.5363	0.5283	0.5283	0.5269	0.5314	0.5363	0.5397	0.5433 (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							
Entrance Door			3.7800	1.4000	5.2920		(26a)
Windows			36.3600	1.3258	48.2045		(27)
Roof Windows			1.9200	1.3258	2.5455		(27a)
House to Garage Door			1.8900	1.4000	2.6460		(26)
Ground Floor			122.4200	0.1200	14.6904	110.0000	13466.2000 (28a)
Above Garage			30.3300	0.1800	5.4594	20.0000	606.6000 (28b)
Cavity Wall	239.3700	34.3500	205.0200	0.1700	34.8534	60.0000	12301.2000 (29a)
Stud / Timber Walls	96.6600	7.6800	88.9800	0.1700	15.1266	9.0000	800.8200 (29a)
Slope Roof	51.2400	1.9200	49.3200	0.1400	6.9048	9.0000	443.8800 (30)
Flat Ceilings	51.1700		51.1700	0.1400	7.1638	9.0000	460.5300 (30)
Between 1st & 2nd Floors	87.6900		87.6900	0.1400	12.2766	9.0000	789.2100 (30)
Dormer Roofs	7.2000		7.2000	0.1400	1.0080	9.0000	64.8000 (30)
Total net area of external elements Aum(A, m ²)			686.0800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		156.1710		(33)
Main dwelling							
Internal Walls			535.8600			9.0000	4822.7400 (32c)
First Floor			122.4200			18.0000	2203.5600 (32d)
Second Floor			54.9600			18.0000	989.2800 (32d)
Ground Floor Ceiling			122.4200			9.0000	1101.7800 (32e)
First Floor Ceiling			54.8600			9.0000	493.7400 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 38544.3400 (34)
120.4398 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	27.9000	0.0380	1.0602
E4 Jamb	59.0000	0.0160	0.9440
E16 Corner (normal)	80.8500	0.0390	3.1531
E10 Eaves (insulation at ceiling level)	74.0000	0.0610	4.5140
E11 Eaves (insulation at rafter level)	43.7000	0.0100	0.4370
E17 Corner (inverted - internal area greater than external area)	54.2500	-0.0910	-4.9367
E14 Flat roof	16.8000	0.1600	2.6880
E3 Sill	25.2000	0.0210	0.5292
E5 Ground floor (normal)	48.6000	0.0370	1.7982
E6 Intermediate floor within a dwelling	59.4300	0.0030	0.1783
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360

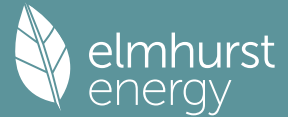
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
(36a) = 0.0000
Total fabric heat loss
(33) + (36) + (36a) = 169.2243 (37)

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	162.3417	161.7578	161.1855	158.4973	157.9944	155.6530	155.6530	155.2195	156.5549	157.9944	159.0118	160.0755 (38)
Heat transfer coeff	331.5660	330.9821	330.4098	327.7216	327.2187	324.8773	324.8773	324.4438	325.7792	327.2187	328.2361	329.2998 (39)
Average = Sum(39)m / 12 =												327.7192

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0360	1.0342	1.0324	1.0240	1.0225	1.0151	1.0151	1.0138	1.0180	1.0225	1.0256	1.0290 (40)
HLP (average)												1.0240

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Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												3.1580 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	33.3083	32.8136	32.1170	30.8326	29.8708	28.8044	28.2284	28.9201	29.6733	30.8144	32.1252	33.1957 (42b)
Hot water usage for other uses	46.9708	45.2627	43.5547	41.8467	40.1386	38.4306	38.4306	40.1386	41.8467	43.5547	45.2627	46.9708 (42c)
Average daily hot water use (litres/day)												73.5827 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	80.2790	78.0763	75.6717	72.6793	70.0095	67.2350	66.6590	69.0587	71.5199	74.3691	77.3880	80.1664 (44)
Energy conte	127.1424	111.1797	116.3046	99.4943	94.2462	82.6733	80.6183	85.5091	88.1912	100.9181	110.2534	125.5213 (45)
Energy content (annual)										Total = Sum(45)m =		1222.0517
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	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												
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												
108.0710	94.5027	98.8589	84.5701	80.1093	70.2723	68.5255	72.6828	74.9625	85.7804	93.7154	106.6931	(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	108.0710	94.5027	98.8589	84.5701	80.1093	70.2723	68.5255	72.6828	74.9625	85.7804	93.7154	106.6931 (64)

12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1038.7440 (64)
Electric shower(s)	61.7992	55.0636	60.1274	57.3788	58.4555	55.7609	57.6196	58.4555	57.3788	60.1274	58.9968	61.7992 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 702.9627 (64a)												
Heat gains from water heating, kWh/month	42.4676	37.3916	39.7466	35.4872	34.6412	31.5083	31.5363	32.7846	33.0853	36.4769	38.1780	42.1231 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	265.1194	293.5251	265.1194	273.9567	265.1194	273.9567	265.1194	265.1194	273.9567	265.1194	273.9567	265.1194 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	474.2892	479.2108	466.8085	440.4053	407.0760	375.7512	354.8243	349.9027	362.3051	388.7082	422.0375	453.3623 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898	38.7898 (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)	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188 (71)
Water heating gains (Table 5)	57.0801	55.6422	53.4228	49.2878	46.5607	43.7615	42.3875	44.0653	45.9519	49.0282	53.0250	56.6170 (72)
Total internal gains	866.8582	898.7477	855.7202	834.0194	789.1257	763.8390	732.7007	729.4569	752.5832	773.2253	819.3888	845.4683 (73)

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northeast	1.4400	11.2829	0.7600	0.7000	0.7700	5.9900 (75)						
East	4.3200	19.6403	0.7600	0.7000	0.7700	31.2807 (76)						
South	26.5200	46.7521	0.7600	0.7000	0.7700	457.1084 (78)						
West	2.6400	19.6403	0.7600	0.7000	0.7700	19.1160 (80)						
Northwest	1.4400	11.2829	0.7600	0.7000	0.7700	5.9900 (81)						
North	0.4800	15.2954	0.7600	0.7000	1.0000	3.5153 (82)						
East	0.9600	25.9287	0.7600	0.7000	1.0000	11.9181 (82)						
West	0.4800	25.9287	0.7600	0.7000	1.0000	5.9590 (82)						

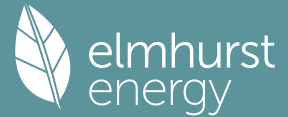
Solar gains	540.8775	913.9104	1232.3923	1499.3480	1656.0609	1634.3288	1579.6901	1463.9312	1324.8528	1005.0411	646.4593	463.7972 (83)
Total gains	1407.7357	1812.6580	2088.1125	2333.3674	2445.1866	2398.1678	2312.3908	2193.3881	2077.4360	1778.2664	1465.8480	1309.2655 (84)

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	32.2915	32.3485	32.4045	32.6703	32.7205	32.9563	32.9563	33.0004	32.8651	32.7205	32.6191	32.5137
alpha	3.1528	3.1566	3.1603	3.1780	3.1814	3.1971	3.1971	3.2000	3.1910	3.1814	3.1746	3.1676
util living area	0.9900	0.9778	0.9578	0.9144	0.8366	0.7049	0.5597	0.6013	0.7905	0.9351	0.9814	0.9920 (86)
MIT	18.5632	18.9073	19.3567	19.9185	20.4107	20.7698	20.9199	20.8972	20.6417	19.9721	19.1567	18.5047 (87)
Th 2	20.0534	20.0549	20.0564	20.0634	20.0647	20.0707	20.0707	20.0719	20.0684	20.0647	20.0620	20.0593 (88)
util rest of house	0.9882	0.9739	0.9501	0.8976	0.8019	0.6382	0.4612	0.5050	0.7356	0.9192	0.9775	0.9906 (89)
MIT 2	17.7997	18.1421	18.5872	19.1400	19.6061	19.9247	20.0345	20.0223	19.8222	19.2008	18.3970	17.7454 (90)
Living area fraction												
MIT	17.8578	18.2003	18.6457	19.1993	19.6673	19.9890	20.1019	20.0889	19.8846	19.2595	18.4548	17.8032 (92)

fLA = Living area / (4) =												

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Temperature adjustment												0.0000
adjusted MIT	17.8578	18.2003	18.6457	19.1993	19.6673	19.9890	20.1019	20.0889	19.8846	19.2595	18.4548	17.8032 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9822	0.9633	0.9348	0.8785	0.7846	0.6317	0.4647	0.5069	0.7231	0.9013	0.9680	0.9855	(94)
Useful gains	1382.6663	1746.2095	1952.0597	2049.9110	1918.5781	1514.9785	1074.6312	1111.9113	1502.1200	1602.8274	1418.9247	1290.3272	(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	4495.3149	4402.1704	4013.0726	3375.2919	2607.0523	1750.7596	1137.6959	1196.8464	1884.4980	2833.5539	3727.0570	4479.5349	(97)
Space heating kWh	2315.8106	1784.8058	1533.3936	954.2742	512.2248	0.0000	0.0000	0.0000	0.0000	915.6605	1661.8552	2372.7705	(98a)
Space heating requirement - total per year (kWh/year)												12050.7952	
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	2315.8106	1784.8058	1533.3936	954.2742	512.2248	0.0000	0.0000	0.0000	0.0000	915.6605	1661.8552	2372.7705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12050.7952	
Space heating per m2										(98c) / (4) =		37.6552	(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	3053.8470	2404.0923	2465.7726	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7025	0.7822	0.7532	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2145.2450	1880.3754	1857.1263	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2632.4688	2539.3724	2410.2702	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	350.8011	490.2938	411.5390	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =				(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	87.7003	122.5734	102.8848	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												313.1585	(107)
Energy for space heating												37.6552	(99)
Energy for space cooling												0.9785	(108)
Total												38.6337	(109)
Fabric Energy Efficiency (DFEE)												38.6	(109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

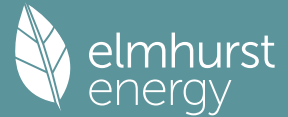
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	122.4200 (1b)	x 2.4500 (2b)	= 299.9290 (1b) - (3b)	
First floor	142.6500 (1c)	x 3.0000 (2c)	= 427.9500 (1c) - (3c)	
Second floor	54.9600 (1d)	x 3.0000 (2d)	= 164.8800 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	320.0300		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	892.7590 (5)
Dwelling volume				

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.0448 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.2948	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2506 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3195	0.3132	0.3070	0.2756	0.2694	0.2381	0.2381	0.2318	0.2506	0.2694	0.2819	0.2944	(22b)

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If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)
Effective ac 0.5510 0.5491 0.5471 0.5380 0.5363 0.5283 0.5283 0.5269 0.5314 0.5363 0.5397 0.5433 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Semi-glazed door			3.7800	1.0000	3.7800		(26a)
TER Opening Type			36.3600	1.1450	41.6336		(27)
TER Roof Window			1.9200	1.1450	2.7170		(27a)
Ground Floor			122.4200	0.1300	15.9146		(28a)
Above Garage			30.3300	0.1300	3.9429		(28b)
Cavity Wall	239.3700	34.3500	205.0200	0.1800	36.9036		(29a)
Stud / Timber Walls	96.6600	7.6800	88.9800	0.1800	16.0164		(29a)
Slope Roof	51.2400	1.9200	49.3200	0.1100	5.4252		(30)
Flat Ceilings	51.1700		51.1700	0.1100	5.6287		(30)
Between 1st & 2nd Floors	87.6900		87.6900	0.1100	9.6459		(30)
Dormer Roofs	7.2000		7.2000	0.1100	0.7920		(30)
Total net area of external elements Aum(A, m2)			686.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 144.2899		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							120.4398 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				27.9000	0.0500	1.3950	
E4 Jamb				59.0000	0.0500	2.9500	
E16 Corner (normal)				80.8500	0.0900	7.2765	
E10 Eaves (insulation at ceiling level)				74.0000	0.0600	4.4400	
E11 Eaves (insulation at rafter level)				43.7000	0.0400	1.7480	
E17 Corner (inverted - internal area greater than external area)				54.2500	-0.0900	-4.8825	
E14 Flat roof				16.8000	0.0800	1.3440	
E3 Sill				25.2000	0.0500	1.2600	
E5 Ground floor (normal)				48.6000	0.1600	7.7760	
E6 Intermediate floor within a dwelling				59.4300	0.0000	0.0000	
R1 Head of roof window				2.4000	0.0800	0.1920	
R2 Sill of roof window				2.4000	0.0600	0.1440	
R3 Jamb of roof window				6.4000	0.0800	0.5120	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						24.1550	(36)
Point Thermal bridges						(36a) = 0.0000	
Total fabric heat loss						(33) + (36) + (36a) = 168.4449	(37)

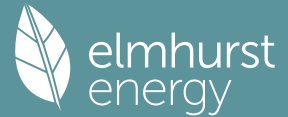
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	162.3417	161.7578	161.1855	158.4973	157.9944	155.6530	155.6530	155.2195	156.5549	157.9944	159.0118	160.0755
Average = Sum(39)m / 12 =	330.7866	330.2027	329.6304	326.9422	326.4392	324.0979	324.0979	323.6643	324.9998	326.4392	327.4567	328.5204
												326.9398
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0336	1.0318	1.0300	1.0216	1.0200	1.0127	1.0127	1.0114	1.0155	1.0200	1.0232	1.0265
HLP (average)												1.0216
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												3.1580 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												33.3083 (42b)
Hot water usage for other uses												46.9708 (42c)
Average daily hot water use (litres/day)												73.5827 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	80.2790	78.0763	75.6717	72.6793	70.0095	67.2350	66.6590	69.0587	71.5199	74.3691	77.3880	80.1664
Energy conte	127.1424	111.1797	116.3046	99.4943	94.2462	82.6733	80.6183	85.5091	88.1912	100.9181	110.2534	125.5213
Energy content (annual)												Total = Sum(45)m = 1222.0517 (45)
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
Water storage loss (or HIU loss):												0.0000 (46)
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	108.0710	94.5027	98.8589	84.5701	80.1093	70.2723	68.5255	72.6828	74.9625	85.7804	93.7154	106.6931
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	108.0710	94.5027	98.8589	84.5701	80.1093	70.2723	68.5255	72.6828	74.9625	85.7804	93.7154	106.6931
12Total per year (kWh/year)												1038.7440 (64)
Electric shower(s)												1039 (64)
Heat gains from water heating, kWh/month												
	61.7992	55.0636	60.1274	57.3788	58.4555	55.7609	57.6196	58.4555	57.3788	60.1274	58.9968	61.7992
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												702.9627 (64a)
	42.4676	37.3916	39.7466	35.4872	34.6412	31.5083	31.5363	32.7846	33.0853	36.4769	38.1780	42.1231

4. Water heating energy requirements (kWh/year)

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
	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984	157.8984

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	122.4200 (1b)	x 2.4500 (2b)	= 299.9290 (1b) - (3b)
First floor	142.6500 (1c)	x 3.0000 (2c)	= 427.9500 (1c) - (3c)
Second floor	54.9600 (1d)	x 3.0000 (2d)	= 164.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	320.0300		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	892.7590 (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	8 * 10 = 80.0000 (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) =	80.0000 / (5) = 0.0896 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3396 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2887 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3681	0.3608	0.3536	0.3175	0.3103	0.2742	0.2742	0.2670	0.2887	0.3103	0.3248	0.3392 (22b)
Effective ac	0.5677	0.5651	0.5625	0.5504	0.5481	0.5376	0.5376	0.5356	0.5417	0.5481	0.5527	0.5575 (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							
Entrance Door			3.7800	1.4000	5.2920		(26a)
Windows			36.3600	1.3258	48.2045		(27)
Roof Windows			1.9200	1.3258	2.5455		(27a)
House to Garage Door			1.8900	1.4000	2.6460		(26)
Ground Floor			122.4200	0.1200	14.6904	110.0000	13466.2000 (28a)
Above Garage			30.3300	0.1800	5.4594	20.0000	606.6000 (28b)
Cavity Wall	239.3700	34.3500	205.0200	0.1700	34.8534	60.0000	12301.2000 (29a)
Stud / Timber Walls	96.6600	7.6800	88.9800	0.1700	15.1266	9.0000	800.8200 (29a)
Slope Roof	51.2400	1.9200	49.3200	0.1400	6.9048	9.0000	443.8800 (30)
Flat Ceilings	51.1700		51.1700	0.1400	7.1638	9.0000	460.5300 (30)
Between 1st & 2nd Floors	87.6900		87.6900	0.1400	12.2766	9.0000	789.2100 (30)
Dormer Roofs	7.2000		7.2000	0.1400	1.0080	9.0000	64.8000 (30)
Total net area of external elements Aum(A, m ²)			686.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	156.1710		(33)

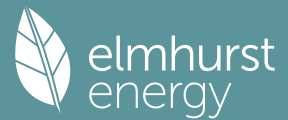
Main dwelling							
Internal Walls			535.8600			9.0000	4822.7400 (32c)
First Floor			122.4200			18.0000	2203.5600 (32d)
Second Floor			54.9600			18.0000	989.2800 (32d)
Ground Floor Ceiling			122.4200			9.0000	1101.7800 (32e)
First Floor Ceiling			54.8600			9.0000	493.7400 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 38544.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 120.4398 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	27.9000	0.0380	1.0602
E4 Jamb	59.0000	0.0160	0.9440
E16 Corner (normal)	80.8500	0.0390	3.1531
E10 Eaves (insulation at ceiling level)	74.0000	0.0610	4.5140
E11 Eaves (insulation at rafter level)	43.7000	0.0100	0.4370
E17 Corner (inverted - internal area greater than external area)	54.2500	-0.0910	-4.9367
E14 Flat roof	16.8000	0.1600	2.6880
E3 Sill	25.2000	0.0210	0.5292
E5 Ground floor (normal)	48.6000	0.0370	1.7982
E6 Intermediate floor within a dwelling	59.4300	0.0030	0.1783
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.0533 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 169.2243 (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
	167.2596	166.4847	165.7252	162.1578	161.4904	158.3833	158.3833	157.8079	159.5801	161.4904	162.8406	164.2522 (38)

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Heat transfer coeff
336.4838 335.7090 334.9495 331.3821 330.7147 327.6076 327.6076 327.0322 328.8044 330.7147 332.0649 333.4765 (39)
Average = Sum(39)m / 12 = 331.3789

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0514	1.0490	1.0466	1.0355	1.0334	1.0237	1.0237	1.0219	1.0274	1.0334	1.0376	1.0420	(40)
HLP (average)												1.0355	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3,1580 (42)
Hot water usage for mixer showers 106.1069 104.5123 102.1887 97.7429 94.4620 90.8032 88.7235 91.0295 93.5573 97.4858 102.0271 105.7004 (42a)
Hot water usage for baths 33.3083 32.8136 32.1170 30.8326 29.8708 28.8044 28.2284 28.9201 29.6733 30.8144 32.1252 33.1957 (42b)
Hot water usage for other uses 46.9708 45.2627 43.5547 41.8467 40.1386 38.4306 38.4306 40.1386 41.8467 43.5547 45.2627 46.9708 (42c)
Average daily hot water use (litres/day) 171.4097 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	186.3859	182.5887	177.8604	170.4222	164.4715	158.0382	155.3825	160.0882	165.0773	171.8549	179.4151	185.8668	(44)
Energy conte	295.1898	260.0038	273.3648	233.2994	221.4102	194.3264	187.9216	198.2227	203.5568	233.2055	255.6097	291.0225	(45)
Energy content (annual)										Total = Sum(45)m =		2847.1332	
Distribution loss (46)m = 0.15 x (45)m	44.2785	39.0006	41.0047	34.9949	33.2115	29.1490	28.1882	29.7334	30.5335	34.9808	38.3415	43.6534	(46)
Water storage loss (or HIU loss):												250.0000	(47)
Store volume												2.0800	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												1.1232	(55)
Enter (49) or (54) in (55)													
Total storage loss	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	(56)
If cylinder contains dedicated solar storage	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	(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	353.2714	312.4646	331.4464	289.5074	279.4918	250.5344	246.0032	256.3043	259.7648	291.2871	311.8177	349.1041	(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	353.2714	312.4646	331.4464	289.5074	279.4918	250.5344	246.0032	256.3043	259.7648	291.2871	311.8177	349.1041	(64)
								Total per year (kWh/year) = Sum(64)m =				3530.9972	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	144.6159	128.4199	137.3591	122.5385	120.0842	109.5799	108.9492	112.3743	112.6490	124.0061	129.9566	143.2303	(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	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.2473	68.6104	55.7977	42.2425	31.5767	26.6584	28.8054	37.4423	50.2550	63.8102	74.4759	79.3943	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	707.8943	715.2400	696.7290	657.3213	607.5762	560.8227	529.5885	522.2428	540.7538	580.1615	629.9067	676.6601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	(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)	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	(71)
Water heating gains (Table 5)	194.3762	191.1011	184.6224	170.1923	161.4035	152.1943	146.4371	151.0408	156.4570	166.6749	180.4953	192.5138	(72)
Total internal gains	1099.7830	1095.2167	1057.4144	990.0213	920.8215	859.9406	825.0962	830.9910	867.7309	930.9118	1005.1431	1068.8334	(73)

6. Solar gains

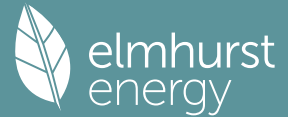
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	1.4400	11.2829	0.7600	0.7000	0.7700	5.9900	(75)						
East	4.3200	19.6403	0.7600	0.7000	0.7700	31.2807	(76)						
South	26.5200	46.7521	0.7600	0.7000	0.7700	457.1084	(78)						
West	2.6400	19.6403	0.7600	0.7000	0.7700	19.1160	(80)						
Northwest	1.4400	11.2829	0.7600	0.7000	0.7700	5.9900	(81)						
North	0.4800	15.2954	0.7600	0.7000	1.0000	3.5153	(82)						
East	0.9600	25.9287	0.7600	0.7000	1.0000	11.9181	(82)						
West	0.4800	25.9287	0.7600	0.7000	1.0000	5.9590	(82)						
Solar gains	540.8775	913.9104	1232.3923	1499.3480	1656.0609	1634.3288	1579.6901	1463.9312	1324.8528	1005.0411	646.4593	463.7972	(83)
Total gains	1640.6605	2009.1270	2289.8067	2489.3693	2576.8824	2494.2694	2404.7863	2294.9223	2192.5837	1935.9528	1651.6024	1532.6306	(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	31.8195	31.8930	31.9653	32.3094	32.3746	32.6817	32.6817	32.7392	32.5627	32.3746	32.2430	32.1065	
alpha	3.1213	3.1262	3.1310	3.1540	3.1583	3.1788	3.1788	3.1826	3.1708	3.1583	3.1495	3.1404	

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util living area	0.9847	0.9710	0.9475	0.9022	0.8219	0.6911	0.5459	0.5845	0.7731	0.9216	0.9744	0.9875 (86)
Living	19.1442	19.3845	19.7205	20.1244	20.4799	20.7381	20.8463	20.8312	20.6493	20.1720	19.5770	19.1020
Non living	17.8387	18.1452	18.5713	19.0816	19.5118	19.8062	19.9068	19.8971	19.7148	19.1496	18.3993	17.7904
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0
16 / 9	21	28	2	0	0	0	0	0	0	0	0	31
MIT	20.2880	20.0850	19.7563	20.1244	20.4799	20.7381	20.8463	20.8312	20.6493	20.1720	19.5770	19.9251 (87)
Th 2	20.0407	20.0427	20.0447	20.0539	20.0556	20.0636	20.0636	20.0651	20.0605	20.0556	20.0521	20.0485 (88)
util rest of house												
MIT	0.9821	0.9661	0.9381	0.8836	0.7853	0.6235	0.4479	0.4885	0.7160	0.9030	0.9692	0.9854 (89)
MIT 2	19.3823	19.2052	18.6244	19.0816	19.5118	19.8062	19.9068	19.8971	19.7148	19.1496	18.3993	19.0518 (90)
Living area fraction									fLA = Living area / (4) =			0.0761 (91)
MIT	19.4513	19.2722	18.7105	19.1610	19.5855	19.8771	19.9784	19.9682	19.7859	19.2274	18.4890	19.1183 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4513	19.2722	18.7105	19.1610	19.5855	19.8771	19.9784	19.9682	19.7859	19.2274	18.4890	19.1183 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9801	0.9612	0.9212	0.8620	0.7640	0.6085	0.4393	0.4776	0.6966	0.8820	0.9572	0.9827	(94)
Useful gains	1608.0367	1931.2307	2109.4651	2145.9175	1968.8219	1517.7411	1054.0201	1096.0805	1527.3703	1707.5949	1580.8713	1506.1469	(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	5098.1552	4824.8635	4089.9161	3400.3110	2607.8365	1728.8254	1106.7747	1166.9072	1869.5649	2853.2162	3781.8823	4974.8936	(97)
Space heating kWh	2596.6481	1944.5212	1473.4555	903.1633	475.4269	0.0000	0.0000	0.0000	0.0000	852.3422	1584.7279	2580.7475	(98a)
Space heating requirement - total per year (kWh/year)												12411.0327	
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	2596.6481	1944.5212	1473.4555	903.1633	475.4269	0.0000	0.0000	0.0000	0.0000	852.3422	1584.7279	2580.7475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12411.0327	
Space heating per m2										(98c) / (4) =		38.7808	(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 %)												296.5298	(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	2596.6481	1944.5212	1473.4555	903.1633	475.4269	0.0000	0.0000	0.0000	0.0000	852.3422	1584.7279	2580.7475	(98)
Space heating efficiency (main heating system 1)	296.5298	296.5298	296.5298	296.5298	296.5298	0.0000	0.0000	0.0000	0.0000	296.5298	296.5298	296.5298	(210)
Space heating fuel (main heating system)	875.6785	655.7590	496.8996	304.5775	160.3302	0.0000	0.0000	0.0000	0.0000	287.4389	534.4244	870.3163	(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	353.2714	312.4646	331.4464	289.5074	279.4918	250.5344	246.0032	256.3043	259.7648	291.2871	311.8177	349.1041	(64)
Efficiency of water heater (217)m	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	(216)
Fuel for water heating, kWh/month	219.7252	194.3445	206.1506	180.0657	173.8363	155.8255	153.0073	159.4143	161.5666	181.1726	193.9421	217.1332	(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	67.6141	54.2426	48.8394	35.7819	27.6389	22.5812	25.2132	32.7730	42.5689	55.8527	63.0855	69.4933	(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												4185.4245	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												160.7788	
Water heating fuel used												2196.1838	(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)												545.6848	(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)

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Energy used 0.0000 (237)
Total delivered energy for all uses 6927.2931 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4185.4245	16.4900	690.1765 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2196.1838	16.4900	362.1507 (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	545.6848	16.4900	89.9834 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1142.3106 (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] = 1.1266 (257)
SAP value 81.7383
SAP rating (Section 12) 82 (258)
SAP band B

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	4185.4245	0.1553	650.0522 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2196.1838	0.1410	309.7130 (264)
Space and water heating			959.7652 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	545.6848	0.1443	78.7592 (268)
Total CO2, kg/year			1038.5244 (272)
CO2 emissions per m2			3.2500 (273)
EI value			96.1876
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

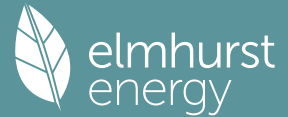
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	122.4200 (1b)	x 2.4500 (2b)	= 299.9290 (1b) - (3b)
First floor	142.6500 (1c)	x 3.0000 (2c)	= 427.9500 (1c) - (3c)
Second floor	54.9600 (1d)	x 3.0000 (2d)	= 164.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	320.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	892.7590 (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	8 * 10 = 80.0000 (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) =	80.0000 / (5) = 0.0896 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3396 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2887 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.9000	3.5000	3.6000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9750	0.8750	0.9000	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.2959	0.2742	0.2815	0.2526	0.2598	0.2309	0.2382	0.2237	0.2237	0.2454	0.2382	0.2670 (22b)
Effective ac	0.5438	0.5376	0.5396	0.5319	0.5337	0.5267	0.5284	0.5250	0.5250	0.5301	0.5284	0.5356 (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								
Entrance Door			3.7800	1.4000	5.2920			(26a)
Windows			36.3600	1.3258	48.2045			(27)
Roof Windows			1.9200	1.3258	2.5455			(27a)
House to Garage Door			1.8900	1.4000	2.6460			(26)
Ground Floor			122.4200	0.1200	14.6904	110.0000	13466.2000	(28a)
Above Garage			30.3300	0.1800	5.4594	20.0000	606.6000	(28b)
Cavity Wall	239.3700	34.3500	205.0200	0.1700	34.8534	60.0000	12301.2000	(29a)
Stud / Timber Walls	96.6600	7.6800	88.9800	0.1700	15.1266	9.0000	800.8200	(29a)
Slope Roof	51.2400	1.9200	49.3200	0.1400	6.9048	9.0000	443.8800	(30)
Flat Ceilings	51.1700		51.1700	0.1400	7.1638	9.0000	460.5300	(30)
Between 1st & 2nd Floors	87.6900		87.6900	0.1400	12.2766	9.0000	789.2100	(30)
Dormer Roofs	7.2000		7.2000	0.1400	1.0080	9.0000	64.8000	(30)
Total net area of external elements Aum(A, m2)			686.0800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	156.1710		(33)
Main dwelling								
Internal Walls			535.8600			9.0000	4822.7400	(32c)
First Floor			122.4200			18.0000	2203.5600	(32d)
Second Floor			54.9600			18.0000	989.2800	(32d)
Ground Floor Ceiling			122.4200			9.0000	1101.7800	(32e)
First Floor Ceiling			54.8600			9.0000	493.7400	(32e)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 38544.3400 (34)

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

120.4398 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	27.9000	0.0380	1.0602
E2 Other lintels (including other steel lintels)	59.0000	0.0160	0.9440
E4 Jamb	80.8500	0.0390	3.1531
E16 Corner (normal)	74.0000	0.0610	4.5140
E10 Eaves (insulation at ceiling level)	43.7000	0.0100	0.4370
E11 Eaves (insulation at rafter level)	54.2500	-0.0910	-4.9367
E17 Corner (inverted - internal area greater than external area)	16.8000	0.1600	2.6880
E14 Flat roof	25.2000	0.0210	0.5292
E3 Sill	48.6000	0.0370	1.7982
E5 Ground floor (normal)	59.4300	0.0030	0.1783
E6 Intermediate floor within a dwelling	2.4000	0.2400	0.5760
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	6.4000	0.2400	1.5360
R3 Jamb of roof window			

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

13.0533 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 169.2243 (37)

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

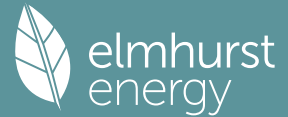
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	160.2015	158.3833	158.9740	156.7032	157.2479	155.1611	155.6598	154.6778	154.6778	156.1738	155.6598	157.8079
Heat transfer coeff	329.4258	327.6076	328.1983	325.9275	326.4722	324.3854	324.8841	323.9021	323.9021	325.3981	324.8841	327.0322
Average = Sum(39)m / 12 =												326.0016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0294	1.0237	1.0255	1.0184	1.0201	1.0136	1.0152	1.0121	1.0121	1.0168	1.0152	1.0219
HLP (average)												1.0187
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1580 (42)	
Hot water usage for mixer showers														
106.1069	104.5123	102.1887	97.7429	94.4620	90.8032	88.7235	91.0295	93.5573	97.4858	102.0271	105.7004	(42a)		
Hot water usage for baths														
33.3083	32.8136	32.1170	30.8326	29.8708	28.8044	28.2284	28.9201	29.6733	30.8144	32.1252	33.1957	(42b)		
Hot water usage for other uses														
46.9708	45.2627	43.5547	41.8467	40.1386	38.4306	38.4306	40.1386	41.8467	43.5547	45.2627	46.9708	(42c)		
Average daily hot water use (litres/day)													171.4097 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	186.3859	182.5887	177.8604	170.4222	164.4715	158.0382	155.3825	160.0882	165.0773	171.8549	179.4151	185.8668	(44)	
Energy conte	295.1898	260.0038	273.3648	233.2994	221.4102	194.3264	187.9216	198.2227	203.5568	233.2055	255.6097	291.0225	(45)	
Energy content (annual)										Total = Sum(45)m =		2847.1332		
Distribution loss (46)m = 0.15 x (45)m														
44.2785	39.0006	41.0047	34.9949	33.2115	29.1490	28.1882	29.7334	30.5335	34.9808	38.3415	43.6534	(46)		
Water storage loss (or HIU loss):														
Store volume													250.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):													2.0800 (48)	
Temperature factor from Table 2b													0.5400 (49)	
Enter (49) or (54) in (55)													1.1232 (55)	
Total storage loss														
34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	(56)		
If cylinder contains dedicated solar storage														
34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	(57)		
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(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														
353.2714	312.4646	331.4464	289.5074	279.4918	250.5344	246.0032	256.3043	259.7648	291.2871	311.8177	349.1041	(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	353.2714	312.4646	331.4464	289.5074	279.4918	250.5344	246.0032	256.3043	259.7648	291.2871	311.8177	349.1041	(64)	
										Total per year (kWh/year) = Sum(64)m =		3530.9972	(64)	
Electric shower(s)														
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000 (64a)
Heat gains from water heating, kWh/month														
144.6159	128.4199	137.3591	122.5385	120.0842	109.5799	108.9492	112.3743	112.6490	124.0061	129.9566	143.2303	(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	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.2473	68.6104	55.7977	42.2425	31.5767	26.6584	28.8054	37.4423	50.2550	63.8102	74.4759	79.3943
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	707.8943	715.2400	696.7290	657.3213	607.5762	560.8227	529.5885	522.2428	540.7538	580.1615	629.9067	676.6601
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188
Water heating gains (Table 5)	194.3762	191.1011	184.6224	170.1923	161.4035	152.1943	146.4371	151.0408	156.4570	166.6749	180.4953	192.5138
Total internal gains	1099.7830	1095.2167	1057.4144	990.0213	920.8215	859.9406	825.0962	830.9910	867.7309	930.9118	1005.1431	1068.8334

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W		
Northeast				1.4400	13.7758		0.7600		0.7000		0.7700		7.3135 (75)		
East				4.3200	23.7835		0.7600		0.7000		0.7700		37.8795 (76)		
South				26.5200	54.0600		0.7600		0.7000		0.7700		528.5603 (78)		
West				2.6400	23.7835		0.7600		0.7000		0.7700		23.1486 (80)		
Northwest				1.4400	13.7758		0.7600		0.7000		0.7700		7.3135 (81)		
North				0.4800	18.1387		0.7600		0.7000		1.0000		4.1687 (82)		
East				0.9600	31.5802		0.7600		0.7000		1.0000		14.5158 (82)		
West				0.4800	31.5802		0.7600		0.7000		1.0000		7.2579 (82)		
Solar gains				630.1577	945.7056	1246.3686	1548.5693	1677.9125	1749.6206	1687.7173	1595.3970	1430.9617	1097.4476	741.6945	543.7058 (83)
Total gains				1729.9407	2040.9222	2303.7830	2538.5905	2598.7340	2609.5612	2512.8135	2426.3880	2298.6926	2028.3594	1746.8376	1612.5392 (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	32.5013	32.6817	32.6228	32.8501	32.7953	33.0063	32.9556	33.0555	33.0555	32.9036	32.9556	32.7392
alpha	3.1668	3.1788	3.1749	3.1900	3.1864	3.2004	3.1970	3.2037	3.2037	3.1936	3.1970	3.1826
util living area	0.9807	0.9674	0.9410	0.8864	0.7897	0.6264	0.4642	0.4981	0.7338	0.9013	0.9676	0.9844
Living	19.2939	19.4999	19.8291	20.2247	20.5686	20.7943	20.8735	20.8653	20.7035	20.2853	19.7068	19.2448
Non living	18.0422	18.3065	18.7205	19.2150	19.6227	19.8675	19.9330	19.9304	19.7818	19.2980	18.5768	17.9842
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	9	0	0	0	0	0	0	0	0	0	0	0
16 / 9	22	26	0	0	0	0	0	0	0	0	0	31
MIT	20.3143	20.1039	19.8291	20.2247	20.5686	20.7943	20.8735	20.8653	20.7035	20.2853	19.7068	20.0059
Th 2	20.0589	20.0636	20.0621	20.0680	20.0666	20.0720	20.0707	20.0733	20.0733	20.0694	20.0707	20.0651
util rest of house	0.9774	0.9617	0.9304	0.8649	0.7466	0.5510	0.3612	0.3960	0.6711	0.8781	0.9610	0.9816
MIT 2	19.4272	19.2180	18.7205	19.2150	19.6227	19.8675	19.9330	19.9304	19.7818	19.2980	18.5768	19.1466
Living area fraction	19.4948	19.2854	18.8049	19.2918	19.6947	19.9380	20.0046	20.0015	19.8520	19.3731	18.6628	0.0761
MIT	19.4948	19.2854	18.8049	19.2918	19.6947	19.9380	20.0046	20.0015	19.8520	19.3731	18.6628	19.2120
Temperature adjustment												0.0000
adjusted MIT	19.4948	19.2854	18.8049	19.2918	19.6947	19.9380	20.0046	20.0015	19.8520	19.3731	18.6628	19.2120

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9750	0.9561	0.9121	0.8432	0.7269	0.5391	0.3535	0.3876	0.6540	0.8563	0.9474	0.9785
Useful gains	1686.6077	1951.2974	2101.3908	2140.6282	1889.0858	1406.7849	888.1752	940.4094	1503.3964	1736.9579	1654.9348	1577.8699
Ext temp.	4.8000	5.3000	7.0000	9.4000	12.4000	15.2000	17.2000	17.0000	14.4000	11.1000	7.5000	4.7000
Heat loss rate W	4840.8302	4581.7271	3874.3537	3224.0162	2381.5221	1536.9413	911.1744	972.1986	1765.9120	2692.0647	3626.6171	4745.9073
Space heating kWh	2346.7415	1767.6487	1319.0844	780.0394	366.3726	0.0000	0.0000	0.0000	0.0000	710.5994	1419.6112	2357.0198
Space heating requirement - total per year (kWh/year)												11067.1172
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
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	2346.7415	1767.6487	1319.0844	780.0394	366.3726	0.0000	0.0000	0.0000	0.0000	710.5994	1419.6112	2357.0198
Space heating requirement after solar contribution - total per year (kWh/year)												11067.1172
Space heating per m ²										(98c) / (4) =		34.5815

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 %)												295.1465 (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	2346.7415	1767.6487	1319.0844	780.0394	366.3726	0.0000	0.0000	0.0000	0.0000	710.5994	1419.6112	2357.0198
Space heating efficiency (main heating system 1)	295.1465	295.1465	295.1465	295.1465	295.1465	0.0000	0.0000	0.0000	0.0000	295.1465	295.1465	295.1465
Space heating fuel (main heating system)	795.1108	598.9056	446.9254	264.2889	124.1325	0.0000	0.0000	0.0000	0.0000	240.7616	480.9853	798.5933

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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	353.2714	312.4646	331.4464	289.5074	279.4918	250.5344	246.0032	256.3043	259.7648	291.2871	311.8177	349.1041	(64)
Efficiency of water heater	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	(216)
Fuel for water heating, kWh/month	219.7513	194.3676	206.1752	180.0871	173.8570	155.8441	153.0255	159.4332	161.5858	181.1942	193.9652	217.1591	(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	(231)
Lighting	67.6141	54.2426	48.8394	35.7819	27.6389	22.5812	25.2132	32.7730	42.5689	55.8527	63.0855	69.4933	(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												3749.7034	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												160.7596	
Water heating fuel used												2196.4452	(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)												545.6848	(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												6491.8334	(238)

10a. Fuel costs - using BEDF prices (587)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3749.7034	28.4300	1066.0407	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2196.4452	28.4300	624.4494	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	545.6848	28.4300	155.1382	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1845.6282	(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	3749.7034	0.1556	583.5294	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2196.4452	0.1410	309.7498	(264)
Space and water heating			893.2793	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	545.6848	0.1443	78.7592	(268)
Total CO2, kg/year			972.0384	(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	3749.7034	1.5761	5909.9744	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2196.4452	1.5215	3341.8016	(278)
Space and water heating			9251.7760	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	545.6848	1.5338	836.9896	(282)
Total Primary energy kWh/year			10088.7656	(286)

SAP 10 EPC IMPROVEMENTS

Plot 4

Full SAP Calculation Printout



Current energy efficiency rating:
Current environmental impact rating:

B 82
A 96

N Solar water heating
U Solar photovoltaic panels
V2 Wind turbine

Recommended
Recommended
Not applicable

Recommended measures:
N Solar water heating
U Solar photovoltaic panels

SAP change Cost change CO2 change
+ 1.0 -£ 118 -52 kg (5.3%)
+ 2.8 -£ 319 -151 kg (16.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£118	0.16 kg/m²	B 83 A 96
Solar photovoltaic panels	£319	0.47 kg/m²	B 86 A 97
Total Savings	£438	0.63 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 587 TEST (28 Nov 2025)
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	£1846	£1727	£118
Space heating	£1066	£1089	-£23
Water heating	£624	£483	£142
Lighting	£155	£155	£0
Generated (PV)	-£0	-£319	£319
Total cost of fuels	£1846	£1408	£437
Total cost of uses	£1845	£1408	£438
Delivered energy	20 kWh/m²	15 kWh/m²	5 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.8 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	2 kg/m²	1 kg/m²
Primary energy	32 kWh/m²	24 kWh/m²	7 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling			
Ground floor	122.4200 (1b)	x 2.4500 (2b)	= 299.9290 (1b) - (3b)
First floor	142.6500 (1c)	x 3.0000 (2c)	= 427.9500 (1c) - (3c)
Second floor	54.9600 (1d)	x 3.0000 (2d)	= 164.8800 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	320.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 892.7590 (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 8 * 10 = 80.0000 (7a)
Number of passive vents 0 * 10 = 0.0000 (7b)
Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
80.0000 / (5) = 0.0896 (8)

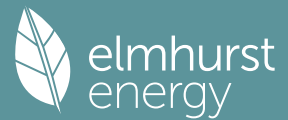
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3396 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2887 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3681	0.3608	0.3536	0.3175	0.3103	0.2742	0.2742	0.2670	0.2887	0.3103	0.3248	0.3392 (22b)
Effective ac	0.5677	0.5651	0.5625	0.5504	0.5481	0.5376	0.5376	0.5356	0.5417	0.5481	0.5527	0.5575 (25)

3. Heat losses and heat loss parameter

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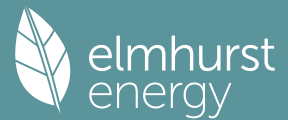


Element													
Main dwelling													
Entrance Door						3.7800	1.4000	5.2920					(26a)
Windows						36.3600	1.3258	48.2045					(27)
Roof Windows						1.9200	1.3258	2.5455					(27a)
House to Garage Door						1.8900	1.4000	2.6460					(26)
Ground Floor						122.4200	0.1200	14.6904	110.0000	13466.2000			(28a)
Above Garage						30.3300	0.1800	5.4594	20.0000	606.6000			(28b)
Cavity Wall	239.3700		34.3500			205.0200	0.1700	34.8534	60.0000	12301.2000			(29a)
Stud / Timber Walls		96.6600		7.6800		88.9800	0.1700	15.1266		9.0000	800.8200		(29a)
Slope Roof		51.2400		1.9200		49.3200	0.1400	6.9048		9.0000	443.8800		(30)
Flat Ceilings		51.1700				51.1700	0.1400	7.1638		9.0000	460.5300		(30)
Between 1st & 2nd Floors		87.6900				87.6900	0.1400	12.2766		9.0000	789.2100		(30)
Dormer Roofs		7.2000				7.2000	0.1400	1.0080		9.0000	64.8000		(30)
Total net area of external elements Aum(A, m2)						686.0800							(31)
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =	156.1710					(33)
Main dwelling													
Internal Walls						535.8600				9.0000	4822.7400		(32c)
First Floor						122.4200				18.0000	2203.5600		(32d)
Second Floor						54.9600				18.0000	989.2800		(32d)
Ground Floor Ceiling						122.4200				9.0000	1101.7800		(32e)
First Floor Ceiling						54.8600				9.0000	493.7400		(32e)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) =			38544.3400		(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											120.4398		(35)
List of Thermal Bridges													
K1 Element							Length	Psi-value		Total			
E2 Other lintels (including other steel lintels)							27.9000	0.0380		1.0602			
E4 Jamb							59.0000	0.0160		0.9440			
E16 Corner (normal)							80.8500	0.0390		3.1531			
E10 Eaves (insulation at ceiling level)							74.0000	0.0610		4.5140			
E11 Eaves (insulation at rafter level)							43.7000	0.0100		0.4370			
E17 Corner (inverted - internal area greater than external area)							54.2500	-0.0910		-4.9367			
E14 Flat roof							16.8000	0.1600		2.6880			
E3 Sill							25.2000	0.0210		0.5292			
E5 Ground floor (normal)							48.6000	0.0370		1.7982			
E6 Intermediate floor within a dwelling							59.4300	0.0030		0.1783			
R1 Head of roof window							2.4000	0.2400		0.5760			
R2 Sill of roof window							2.4000	0.2400		0.5760			
R3 Jamb of roof window							6.4000	0.2400		1.5360			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											13.0533		(36)
Point Thermal bridges										(36a) =	0.0000		
Total fabric heat loss										(33) + (36) + (36a) =	169.2243		(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	167.2596	166.4847	165.7252	162.1578	161.4904	158.3833	158.3833	157.8079	159.5801	161.4904	162.8406	164.2522	(38)
Average = Sum(39)m / 12 =	336.4838	335.7090	334.9495	331.3821	330.7147	327.6076	327.6076	327.0322	328.8044	330.7147	332.0649	333.4765	(39)
												331.3789	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.0514	1.0490	1.0466	1.0355	1.0334	1.0237	1.0237	1.0219	1.0274	1.0334	1.0376	1.0420	(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													3.1580 (42)
Hot water usage for mixer showers													
Hot water usage for baths	106.1069	104.5123	102.1887	97.7429	94.4620	90.8032	88.7235	91.0295	93.5573	97.4858	102.0271	105.7004	(42a)
Hot water usage for other uses	33.3083	32.8136	32.1170	30.8326	29.8708	28.8044	28.2284	28.9201	29.6733	30.8144	32.1252	33.1957	(42b)
Average daily hot water use (litres/day)	46.9708	45.2627	43.5547	41.8467	40.1386	38.4306	38.4306	40.1386	41.8467	43.5547	45.2627	46.9708	(42c)
												171.4097	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	186.3859	182.5887	177.8604	170.4222	164.4715	158.0382	155.3825	160.0882	165.0773	171.8549	179.4151	185.8668	(44)
Energy content (annual)	295.1898	260.0038	273.3648	233.2994	221.4102	194.3264	187.9216	198.2227	203.5568	233.2055	255.6097	291.0225	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2847.1332	
Water storage loss (or HIU loss):	44.2785	39.0006	41.0047	34.9949	33.2115	29.1490	28.1882	29.7334	30.5335	34.9808	38.3415	43.6534	(46)
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1232	(55)
Total storage loss	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	(56)
If cylinder contains dedicated solar storage	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192	(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	353.2714	312.4646	330.0507	282.7538	266.6975	237.9276	232.9763	244.2078	254.3619	289.8913	311.8177	349.1041	(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												656.0964	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												656.0964	
Solar input	-0.0000	-16.1609	-60.0461	-84.0161	-111.8364	-103.4456	-102.8685	-88.7955	-60.0006	-28.9267	-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													

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	353.2714	296.3038	270.0045	198.7377	154.8611	134.4820	130.1077	155.4123	194.3613	260.9647	311.8177	349.1041 (64)
	Total per year (kWh/year) = Sum(64)m =											2809.4284 (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	144.6159	128.4199	136.2425	117.1356	109.8487	99.4945	98.5277	102.6972	108.3267	122.8895	129.9566	143.2303 (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	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.2473	68.6104	55.7977	42.2425	31.5767	26.6584	28.8054	37.4423	50.2550	63.8102	74.4759	79.3943	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	707.8943	715.2400	696.7290	657.3213	607.5762	560.8227	529.5885	522.2428	540.7538	580.1615	629.9067	676.6601	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	(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)	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	(71)
Water heating gains (Table 5)	194.3762	191.1011	183.1216	162.6883	147.6461	138.1869	132.4297	138.0338	150.4538	165.1741	180.4953	192.5138	(72)
Total internal gains	1099.7830	1095.2167	1055.9136	982.5173	907.0642	845.9331	811.0887	817.9841	861.7277	929.4110	1005.1431	1068.8334	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Northeast						1.4400	11.2829	0.7600	0.7000	0.7700	5.9900 (75)	
East						4.3200	19.6403	0.7600	0.7000	0.7700	31.2807 (76)	
South						26.5200	46.7521	0.7600	0.7000	0.7700	457.1084 (78)	
West						2.6400	19.6403	0.7600	0.7000	0.7700	19.1160 (80)	
Northwest						1.4400	11.2829	0.7600	0.7000	0.7700	5.9900 (81)	
North						0.4800	15.2954	0.7600	0.7000	1.0000	3.5153 (82)	
East						0.9600	25.9287	0.7600	0.7000	1.0000	11.9181 (82)	
West						0.4800	25.9287	0.7600	0.7000	1.0000	5.9590 (82)	
Solar gains	540.8775	913.9104	1232.3923	1499.3480	1656.0609	1634.3288	1579.6901	1463.9312	1324.8528	1005.0411	646.4593	463.7972 (83)
Total gains	1640.6605	2009.1270	2288.3059	2481.8653	2563.1251	2480.2619	2390.7788	2281.9153	2186.5805	1934.4520	1651.6024	1532.6306 (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	31.8195	31.8930	31.9653	32.3094	32.3746	32.6817	32.6817	32.7392	32.5627	32.3746	32.2430	32.1065
alpha	3.1213	3.1262	3.1310	3.1540	3.1583	3.1788	3.1788	3.1826	3.1708	3.1583	3.1495	3.1404
util living area												
	0.9847	0.9710	0.9475	0.9028	0.8237	0.6934	0.5484	0.5869	0.7741	0.9218	0.9744	0.9875 (86)
Living	19.1442	19.3845	19.7200	20.1221	20.4769	20.7364	20.8456	20.8303	20.6482	20.1715	19.5770	19.1020
Non living	17.8387	18.1452	18.5706	19.0789	19.5084	19.8047	19.9064	19.8965	19.7138	19.1490	18.3993	17.7904
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0
16 / 9	21	28	2	0	0	0	0	0	0	0	0	31
MIT	20.2880	20.0850	19.7558	20.1221	20.4769	20.7364	20.8456	20.8303	20.6482	20.1715	19.5770	19.9251 (87)
Th 2	20.0407	20.0427	20.0447	20.0539	20.0556	20.0636	20.0636	20.0651	20.0605	20.0556	20.0521	20.0485 (88)
util rest of house												
	0.9821	0.9661	0.9382	0.8843	0.7873	0.6260	0.4502	0.4908	0.7171	0.9032	0.9692	0.9854 (89)
MIT 2	19.3823	19.2052	18.6237	19.0789	19.5084	19.8047	19.9064	19.8965	19.7138	19.1490	18.3993	19.0518 (90)
Living area fraction									fLA = Living area / (4) =			0.0761 (91)
MIT	19.4513	19.2722	18.7099	19.1583	19.5821	19.8756	19.9779	19.9675	19.7849	19.2268	18.4890	19.1183 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4513	19.2722	18.7099	19.1583	19.5821	19.8756	19.9779	19.9675	19.7849	19.2268	18.4890	19.1183 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9801	0.9612	0.9213	0.8628	0.7659	0.6108	0.4405	0.4798	0.6977	0.8822	0.9572	0.9827	(94)
Useful gains	1608.0367	1931.2307	2108.3296	2141.3213	1963.0619	1514.9528	1053.1109	1094.9434	1525.5089	1706.6076	1580.8713	1506.1469	(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	5098.1552	4824.8635	4089.7029	3399.4191	2606.7413	1728.3197	1106.6120	1166.7035	1869.2173	2853.0243	3781.8823	4974.8936	(97)
Space heating kWh	2596.6481	1944.5212	1474.1417	905.8305	478.8974	0.0000	0.0000	0.0000	0.0000	852.9340	1584.7279	2580.7475	(98a)
Space heating requirement - total per year (kWh/year)												12418.4485	
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	2596.6481	1944.5212	1474.1417	905.8305	478.8974	0.0000	0.0000	0.0000	0.0000	852.9340	1584.7279	2580.7475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12418.4485	
Space heating per m ²										(98c) / (4) =		38.8040	(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 %)	296.5298	(206)

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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	2596.6481	1944.5212	1474.1417	905.8305	478.8974	0.0000	0.0000	0.0000	0.0000	852.9340	1584.7279	2580.7475 (98)
Space heating efficiency (main heating system 1)	296.5298	296.5298	296.5298	296.5298	296.5298	0.0000	0.0000	0.0000	0.0000	296.5298	296.5298	296.5298 (210)
Space heating fuel (main heating system)	875.6785	655.7590	497.1310	305.4770	161.5006	0.0000	0.0000	0.0000	0.0000	287.6385	534.4244	870.3163 (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	353.2714	296.3038	270.0045	198.7377	154.8611	134.4820	130.1077	155.4123	194.3613	260.9647	311.8177	349.1041 (64)
Efficiency of water heater (217)m	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788	160.7788 (216)
Fuel for water heating, kWh/month	219.7252	184.2928	167.9355	123.6095	96.3194	83.6442	80.9235	96.6622	120.8874	162.3129	193.9421	217.1332 (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	67.6141	54.2426	48.8394	35.7819	27.6389	22.5812	25.2132	32.7730	42.5689	55.8527	63.0855	69.4933 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-42.3064	-65.5196	-101.5916	-121.7586	-134.1725	-118.6081	-116.8921	-107.9365	-92.3892	-76.5159	-47.9265	-35.8782 (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												4187.9253 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												160.7788
Water heating fuel used												1747.3877 (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)												545.6848 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1061.4952 (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												5499.5027 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4187.9253	16.4900	690.5889 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1747.3877	16.4900	288.1442 (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	545.6848	16.4900	89.9834 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1061.4952	16.4900	-175.0406
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-175.0406 (252)
Total energy cost			906.8680 (255)

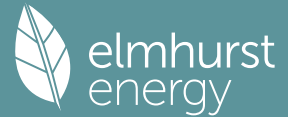
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.8944 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	85.5022
SAP rating (Section 12)		86 (258)
SAP band		B

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	4187.9253	0.1553	650.3979 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1747.3877	0.1446	252.7332 (264)
Space and water heating			903.1311 (265)

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Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	545.6848	0.1443	78.7592 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1061.4952	0.1339	-142.1044
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-142.1044 (269)
Total CO2, kg/year			850.8829 (272)
CO2 emissions per m2			2.6600 (273)
EI value			96.8765
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	122.4200 (1b)	x	2.4500 (2b)	=	299.9290 (1b) - (3b)	
First floor	142.6500 (1c)	x	3.0000 (2c)	=	427.9500 (1c) - (3c)	
Second floor	54.9600 (1d)	x	3.0000 (2d)	=	164.8800 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	320.0300				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	892.7590 (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	8 * 10 =	80.0000 (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) =	80.0000 / (5) =	0.0896 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3396	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2887 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.1000	3.8000	3.9000	3.5000	3.6000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000	(22)
Wind factor	1.0250	0.9500	0.9750	0.8750	0.9000	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250	(22a)
Adj infilt rate	0.2959	0.2742	0.2815	0.2526	0.2598	0.2309	0.2382	0.2237	0.2237	0.2454	0.2382	0.2670	(22b)
Effective ac	0.5438	0.5376	0.5396	0.5319	0.5337	0.5267	0.5284	0.5250	0.5250	0.5301	0.5284	0.5356	(25)

3. Heat losses and heat loss parameter

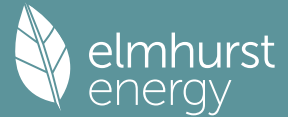
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Entrance Door			3.7800	1.4000	5.2920			(26a)
Windows			36.3600	1.3258	48.2045			(27)
Roof Windows			1.9200	1.3258	2.5455			(27a)
House to Garage Door			1.8900	1.4000	2.6460			(26)
Ground Floor			122.4200	0.1200	14.6904	110.0000	13466.2000	(28a)
Above Garage			30.3300	0.1800	5.4594	20.0000	606.6000	(28b)
Cavity Wall	239.3700	34.3500	205.0200	0.1700	34.8534	60.0000	12301.2000	(29a)
Stud / Timber Walls	96.6600	7.6800	88.9800	0.1700	15.1266	9.0000	800.8200	(29a)
Slope Roof	51.2400	1.9200	49.3200	0.1400	6.9048	9.0000	443.8800	(30)
Flat Ceilings	51.1700		51.1700	0.1400	7.1638	9.0000	460.5300	(30)
Between 1st & 2nd Floors	87.6900		87.6900	0.1400	12.2766	9.0000	789.2100	(30)
Dormer Roofs	7.2000		7.2000	0.1400	1.0080	9.0000	64.8000	(30)
Total net area of external elements Aum(A, m2)			686.0800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	156.1710		(33)
Main dwelling								
Internal Walls			535.8600			9.0000	4822.7400	(32c)
First Floor			122.4200			18.0000	2203.5600	(32d)
Second Floor			54.9600			18.0000	989.2800	(32d)
Ground Floor Ceiling			122.4200			9.0000	1101.7800	(32e)
First Floor Ceiling			54.8600			9.0000	493.7400	(32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	38544.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								120.4398 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				27.9000	0.0380		1.0602	
E4 Jamb				59.0000	0.0160		0.9440	
E16 Corner (normal)				80.8500	0.0390		3.1531	
E10 Eaves (insulation at ceiling level)				74.0000	0.0610		4.5140	

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	160.2015	158.3833	158.9740	156.7032	157.2479	155.1611	155.6598	154.6778	154.6778	156.1738	155.6598	157.8079 (38)
Heat transfer coeff	329.4258	327.6076	328.1983	325.9275	326.4722	324.3854	324.8841	323.9021	323.9021	325.3981	324.8841	327.0322 (39)
Average = Sum(39)m / 12 =												326.0016
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0294	1.0237	1.0255	1.0184	1.0201	1.0136	1.0152	1.0121	1.0121	1.0168	1.0152	1.0219 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												3.1580 (42)
Hot water usage for mixer showers	106.1069	104.5123	102.1887	97.7429	94.4620	90.8032	88.7235	91.0295	93.5573	97.4858	102.0271	105.7004 (42a)
Hot water usage for baths	33.3083	32.8136	32.1170	30.8326	29.8708	28.8044	28.2284	28.9201	29.6733	30.8144	32.1252	33.1957 (42b)
Hot water usage for other uses	46.9708	45.2627	43.5547	41.8467	40.1386	38.4306	38.4306	40.1386	41.8467	43.5547	45.2627	46.9708 (42c)
Average daily hot water use (litres/day)												171.4097 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	186.3859	182.5887	177.8604	170.4222	164.4715	158.0382	155.3825	160.0882	165.0773	171.8549	179.4151	185.8668 (44)
Energy conte	295.1898	260.0038	273.3648	233.2994	221.4102	194.3264	187.9216	198.2227	203.5568	233.2055	255.6097	291.0225 (45)
Energy content (annual)	Total = Sum(45)m =											2847.1332
Distribution loss (46)m = 0.15 x (45)m	44.2785	39.0006	41.0047	34.9949	33.2115	29.1490	28.1882	29.7334	30.5335	34.9808	38.3415	43.6534 (46)
Water storage loss (or HIU loss):												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0800 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1232 (55)
Total storage loss	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192 (56)
If cylinder contains dedicated solar storage	34.8192	31.4496	34.8192	33.6960	34.8192	33.6960	34.8192	34.8192	33.6960	34.8192	33.6960	34.8192 (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	353.2714	312.4646	330.0507	282.7538	266.6975	237.9276	232.9763	244.2078	254.3619	289.8913	311.8177	349.1041 (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												736.1669 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												736.1669
Solar input	-0.0000	-20.1042	-64.3689	-90.9655	-116.5607	-114.4496	-113.7922	-102.2585	-70.6656	-38.6562	-4.3457	-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	353.2714	292.3604	265.6817	191.7883	150.1368	123.4781	119.1841	141.9494	183.6963	251.2351	307.4721	349.1041 (64)
	Total per year (kWh/year) = Sum(64)m =											2729.3578 (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) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	144.6159	128.4199	136.2425	117.1356	109.8487	99.4945	98.5277	102.6972	108.3267	122.8895	129.9566	143.2303 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781	189.4781 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.2473	68.6104	55.7977	42.2425	31.5767	26.6584	28.8054	37.4423	50.2550	63.8102	74.4759	79.3943 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	707.8943	715.2400	696.7290	657.3213	607.5762	560.8227	529.5885	522.2428	540.7538	580.1615	629.9067	676.6601 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058	57.1058 (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)	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188	-126.3188 (71)
Water heating gains (Table 5)	194.3762	191.1011	183.1216	162.6883	147.6461	138.1869	132.4297	138.0338	150.4538	165.1741	180.4953	192.5138 (72)
Total internal gains	1099.7830	1095.2167	1055.9136	982.5173	907.0642	845.9331	811.0887	817.9841	861.7277	929.4110	1005.1431	1068.8334 (73)

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6. Solar gains

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

Northeast				1.4400	13.7758		0.7600		0.7000		0.7700		7.3135 (75)
East				4.3200	23.7835		0.7600		0.7000		0.7700		37.8795 (76)
South				26.5200	54.0600		0.7600		0.7000		0.7700		528.5603 (78)
West				2.6400	23.7835		0.7600		0.7000		0.7700		23.1486 (80)
Northwest				1.4400	13.7758		0.7600		0.7000		0.7700		7.3135 (81)
North				0.4800	18.1387		0.7600		0.7000		1.0000		4.1687 (82)
East				0.9600	31.5802		0.7600		0.7000		1.0000		14.5158 (82)
West				0.4800	31.5802		0.7600		0.7000		1.0000		7.2579 (82)

Solar gains	630.1577	945.7056	1246.3686	1548.5693	1677.9125	1749.6206	1687.7173	1595.3970	1430.9617	1097.4476	741.6945	543.7058	(83)
Total gains	1729.9407	2040.9222	2302.2822	2531.0865	2584.9767	2595.5537	2498.8060	2413.3810	2292.6894	2026.8586	1746.8376	1612.5392	(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	32.5013	32.6817	32.6228	32.8501	32.7953	33.0063	32.9556	33.0555	33.0555	32.9036	32.9556	32.7392
alpha	3.1668	3.1788	3.1749	3.1900	3.1864	3.2004	3.1970	3.2037	3.2037	3.1936	3.1970	3.1826
util living area	0.9807	0.9674	0.9411	0.8871	0.7916	0.6288	0.4664	0.5003	0.7348	0.9014	0.9676	0.9844 (86)
Living	19.2939	19.4999	19.8285	20.2225	20.5659	20.7931	20.8731	20.8648	20.7026	20.2849	19.7068	19.2448
Non living	18.0422	18.3065	18.7199	19.2124	19.6199	19.8665	19.9328	19.9301	19.7810	19.2975	18.5768	17.9842
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	9	0	0	0	0	0	0	0	0	0	0	0
16 / 9	22	26	0	0	0	0	0	0	0	0	0	31
MIT	20.3143	20.1039	19.8285	20.2225	20.5659	20.7931	20.8731	20.8648	20.7026	20.2849	19.7068	20.0059 (87)
Th 2	20.0589	20.0636	20.0621	20.0680	20.0666	20.0720	20.0707	20.0733	20.0733	20.0694	20.0707	20.0651 (88)
util rest of house	0.9774	0.9617	0.9305	0.8657	0.7487	0.5533	0.3631	0.3979	0.6722	0.8783	0.9610	0.9816 (89)
MIT 2	19.4272	19.2180	18.7199	19.2124	19.6199	19.8665	19.9328	19.9301	19.7810	19.2975	18.5768	19.1466 (90)
Living area fraction	19.4948	19.2854	18.8043	19.2893	19.6919	19.9370	20.0044	20.0012	19.8511	19.3726	18.6628	0.0761 (91)
MIT	19.4948	19.2854	18.8043	19.2893	19.6919	19.9370	20.0044	20.0012	19.8511	19.3726	18.6628	19.2120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4948	19.2854	18.8043	19.2893	19.6919	19.9370	20.0044	20.0012	19.8511	19.3726	18.6628	19.2120 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9750	0.9561	0.9123	0.8440	0.7289	0.5413	0.3553	0.3894	0.6551	0.8565	0.9474	0.9785 (94)
Useful gains	1686.6077	1951.2974	2100.2929	2136.3584	1884.2007	1404.9475	887.7595	939.8734	1501.8955	1736.0622	1654.9348	1577.8699 (95)
Ext temp.	4.8000	5.3000	7.0000	9.4000	12.4000	15.2000	17.2000	17.0000	14.4000	11.1000	7.5000	4.7000 (96)
Heat loss rate W	4840.8302	4581.7271	3874.1423	3223.1996	2380.6117	1536.6156	911.0996	972.1029	1765.6383	2691.8929	3626.6171	4745.9073 (97)
Space heating kWh	2346.7415	1767.6487	1319.7439	782.5257	369.3297	0.0000	0.0000	0.0000	0.0000	711.1380	1419.6112	2357.0198 (98a)
Space heating requirement - total per year (kWh/year)												11073.7586
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	2346.7415	1767.6487	1319.7439	782.5257	369.3297	0.0000	0.0000	0.0000	0.0000	711.1380	1419.6112	2357.0198 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11073.7586
Space heating per m2										(98c) / (4) =		34.6023 (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 %)												295.1465 (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	2346.7415	1767.6487	1319.7439	782.5257	369.3297	0.0000	0.0000	0.0000	0.0000	711.1380	1419.6112	2357.0198 (98)
Space heating efficiency (main heating system 1)	295.1465	295.1465	295.1465	295.1465	295.1465	0.0000	0.0000	0.0000	0.0000	295.1465	295.1465	295.1465 (210)
Space heating fuel (main heating system)	795.1108	598.9056	447.1488	265.1313	125.1344	0.0000	0.0000	0.0000	0.0000	240.9441	480.9853	798.5933 (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	353.2714	292.3604	265.6817	191.7883	150.1368	123.4781	119.1841	141.9494	183.6963	251.2351	307.4721	349.1041 (64)
Efficiency of water heater (217)m	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596	160.7596 (216)
Fuel for water heating, kWh/month	219.7513	181.8619	165.2665	119.3013	93.3921	76.8091	74.1381	88.2991	114.2677	156.2800	191.2620	217.1591 (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	67.6141	54.2426	48.8394	35.7819	27.6389	22.5812	25.2132	32.7730	42.5689	55.8527	63.0855	69.4933 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-49.4135	-68.6013	-103.8786	-125.3711	-134.7447	-124.3887	-122.5167	-115.2320	-99.0490	-83.1392	-54.9730	-42.1997 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												3751.9536	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												160.7596	
Water heating fuel used												1697.7881	(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)												545.6848	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1123.5073	(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												4951.9192	(238)

10a. Fuel costs - using BEDF prices (587)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3751.9536	28.4300	1066.6804 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1697.7881	28.4300	482.6811 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	28.4300	22.7440 (249)
Energy for lighting	545.6848	28.4300	155.1382 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1123.5073	28.4300	-319.4131
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-319.4131 (252)
Total energy cost			1407.8306 (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	3751.9536	0.1556	583.8411 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1697.7881	0.1451	246.3991 (264)
Space and water heating			830.2402 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	545.6848	0.1443	78.7592 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1123.5073	0.1341	-150.6407
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-150.6407 (269)
Total CO2, kg/year			769.4557 (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	3751.9536	1.5761	5913.3779 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1697.7881	1.5368	2609.2020 (278)
Space and water heating			8522.5799 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	545.6848	1.5338	836.9896 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1123.5073	1.4955	-1680.2220
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1680.2220 (283)
Total Primary energy kWh/year			7800.3715 (286)