

Full SAP Calculation Printout



Plot Reference	Finchampstead Rd - Plot 1			Issued on Date	14/12/2025
Assessment Reference	Plot 1	Plot Type Ref			
Plot Address	Plot 1, 58, Finchampstead Road, Wokingham, RG40 2NS			SAP Version	10.2
SAP Rating	82 B	DER	3.34	TER	7.37
Environmental	96 A	% DER < TER			54.68
CO ₂ Emissions (t/year)	0.96	DFEE	39.20	TFEE	40.65
Compliance Check	See BREL	% DFEE < TFEE			3.57
% DPER < TPER	12.08	DPER	34.67	TPER	39.43
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	122.5100 (1b)	x 2.4500 (2b)	= 300.1495 (1b) - (3b)
First floor	140.1000 (1c)	x 3.0000 (2c)	= 420.3000 (1c) - (3c)
Second floor	47.1000 (1d)	x 3.0000 (2d)	= 141.3000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	309.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 861.7495 (5)

2. Ventilation rate

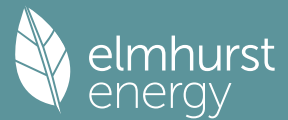
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0928 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3428 (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) = 0.2914 (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	0.3715	0.3643	0.3570	0.3206	0.3133	0.2768	0.2768	0.2696	0.2914	0.3133	0.3278	0.3424 (22b)
Effective ac	0.5690	0.5663	0.5637	0.5514	0.5491	0.5383	0.5383	0.5363	0.5425	0.5491	0.5537	0.5586 (25)

3. Heat losses and heat loss parameter

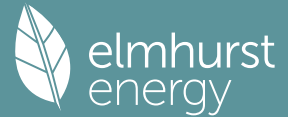
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Entrance Door			2.1000	1.4000	2.9400		(26a)
Windows			40.4900	1.3258	53.6799		(27)
Roof Windows			1.9200	1.3258	2.5455		(27a)
House to Garage Door			1.8900	1.4000	2.6460		(26)
Ground Floor			122.5100	0.1200	14.7012	110.0000	13476.1000 (28a)
Above Garage			37.2000	0.1800	6.6960	20.0000	744.0000 (28b)
Cavity Wall	228.1100	38.4800	189.6300	0.1700	32.2371	60.0000	11377.8000 (29a)
Stud / Timber Walls	92.5800	6.0000	86.5800	0.1700	14.7186	9.0000	779.2200 (29a)
Slope Roof	64.2600	1.9200	62.3400	0.1400	8.7276	9.0000	561.0600 (30)
Flat Ceilings	36.9000		36.9000	0.1400	5.1660	9.0000	332.1000 (30)
Between 1st & 2nd Floors	67.4000		67.4000	0.1400	9.4360	9.0000	606.6000 (30)
Dormer Roofs	4.7700		4.7700	0.1400	0.6678	9.0000	42.9300 (30)
Total net area of external elements A _{um} (A, m ²)			653.7300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 154.1617		(33)
Main dwelling							
Internal Walls			552.3800			9.0000	4971.4200 (32c)
First Floor			122.5100			18.0000	2205.1800 (32d)
Second Floor			47.1000			18.0000	847.8000 (32d)

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Ground Floor Ceiling	122.5100	9.0000	1102.5900 (32e)
First Floor Ceiling	47.1000	9.0000	423.9000 (32e)
Heat capacity Cm = Sum(A x k)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	34.5000	0.0380	1.3110
E4 Jamb	70.0000	0.0160	1.1200
E16 Corner (normal)	77.6000	0.0390	3.0264
E10 Eaves (insulation at ceiling level)	68.6000	0.0610	4.1846
E11 Eaves (insulation at rafter level)	38.5000	0.0100	0.3850
E17 Corner (inverted - internal area greater than external area)	38.6000	-0.0910	-3.5126
E3 Sill	31.7000	0.0210	0.6657
E5 Ground floor (normal)	46.7000	0.0370	1.7279
E6 Intermediate floor within a dwelling	88.6000	0.0030	0.2658
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
E14 Flat roof	16.6000	0.1600	2.6560
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.5178 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	168.6795 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)			
(38)m	Jan	Feb	Mar
Heat transfer coeff	161.8174	161.0552	160.3081
Average = Sum(39)m / 12 =	330.4969	329.7347	328.9875
	Apr	May	Jun
	156.7989	156.1423	153.0860
	Jul	Aug	Sep
	153.0860	152.5200	154.2632
	Oct	Nov	Dec
	156.1423	157.4705	158.8591 (38)
	324.8218	326.1500	327.5386 (39)
	325.4752		325.4752
HLP	Jan	Feb	Mar
HLP (average)	1.0671	1.0647	1.0622
Days in mont	31	28	31
	Apr	May	Jun
	1.0509	1.0488	1.0389
	Jul	Aug	Sep
	1.0389	1.0371	1.0427
	Oct	Nov	Dec
	1.0488	1.0531	1.0576 (40)
			1.0509
			31
4. Water heating energy requirements (kWh/year)			
Assumed occupancy			
Hot water usage for mixer showers			3.1446 (42)
Hot water usage for baths	105.7976	104.2077	101.8908
Hot water usage for other uses	33.2115	32.7183	32.0237
Average daily hot water use (litres/day)	46.8334	45.1303	43.4273
	41.7243	40.0212	38.3182
	38.3182	40.0212	41.7243
	43.4273	45.1303	46.8334 (42c)
			170.9100 (43)
Daily hot water use	Jan	Feb	Mar
Energy conte	185.8425	182.0563	177.3419
Energy content (annual)	294.3291	259.2458	272.5678
Distribution loss (46)m = 0.15 x (45)m	44.1494	38.8869	40.8852
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
If cylinder contains dedicated solar storage	33.6960	34.8192	33.6960
Primary loss	34.8192	31.4496	34.8192
Combi loss	23.2624	21.0112	23.2624
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000
WWHRS	352.4107	311.7066	330.6494
PV diverter	0.0000	0.0000	0.0000
Solar input	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000
Output from w/h	352.4107	311.7066	330.6494
12Total per year (kWh/year)			
Electric shower(s)	0.0000	0.0000	0.0000
Heat gains from water heating, kWh/month	144.3297	128.1679	137.0941
	122.3123	119.8695	109.3915
	108.7670	112.1822	112.4517
	123.7800	129.7088	142.9481 (65)
5. Internal gains (see Table 5 and 5a)			
Metabolic gains (Table 5), Watts			
(66)m	Jan	Feb	Mar
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.2276	157.2276	157.2276
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.9130	280.0108	252.9130
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	466.0806	470.9171	458.7294
Pumps, fans	38.7228	38.7228	38.7228
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000
Water heating gains (Table 5)	-125.7821	-125.7821	-125.7821
Total internal gains	193.9915	190.7260	184.2662
	983.1535	1011.8222	966.0769
	934.1730	884.2270	852.6925
	817.9569	817.7106	843.7292
	871.4331	926.3961	960.7318 (73)
6. Solar gains			

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North				13.1300	10.6334	0.7600	0.7000			0.7700	51.4732 (74)	
East				1.3200	19.6403	0.7600	0.7000			0.7700	9.5580 (76)	
South				26.0400	46.7521	0.7600	0.7000			0.7700	448.8349 (78)	
North				0.9600	15.2954	0.7600	0.7000			1.0000	7.0305 (82)	
East				0.4800	25.9287	0.7600	0.7000			1.0000	5.9590 (82)	
West				0.4800	26.0000	0.7600	0.7000			1.0000	5.9754 (82)	

Solar gains	528.8311	889.5645	1199.7666	1477.7953	1661.9735	1656.8436	1594.2175	1453.1576	1294.1089	977.2705	631.0707	454.2514 (83)
Total gains	1511.9846	1901.3866	2165.8435	2411.9683	2546.2005	2509.5360	2412.1743	2270.8682	2137.8381	1848.7036	1557.4668	1414.9832 (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	31.4936	31.5664	31.6381	31.9792	32.0438	32.3482	32.3482	32.4052	32.2303	32.0438	31.9133	31.7780
alpha	3.0996	3.1044	3.1092	3.1319	3.1363	3.1565	3.1565	3.1603	3.1487	3.1363	3.1276	3.1185
util living area	0.9868	0.9731	0.9512	0.9039	0.8187	0.6799	0.5363	0.5805	0.7744	0.9255	0.9765	0.9892 (86)
Living	19.0888	19.3437	19.6799	20.1067	20.4782	20.7423	20.8472	20.8303	20.6427	20.1475	19.5402	19.0498
Non living	17.7589	18.0841	18.5109	19.0501	19.4987	19.7978	19.8947	19.8839	19.6968	19.1101	18.3434	17.7145
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	20.2318	20.0106	19.6799	20.1067	20.4782	20.7423	20.8472	20.8303	20.6427	20.1475	19.5402	19.8955 (87)
Th 2	20.0278	20.0298	20.0318	20.0411	20.0429	20.0510	20.0510	20.0525	20.0479	20.0429	20.0393	20.0356 (88)
util rest of house	0.9845	0.9684	0.9424	0.8854	0.7813	0.6112	0.4380	0.4835	0.7169	0.9074	0.9716	0.9873 (89)
MIT 2	19.3171	19.0934	18.5109	19.0501	19.4987	19.7978	19.8947	19.8839	19.6968	19.1101	18.3434	19.0111 (90)
Living area fraction									fLA = Living area / (4) =			0.0650 (91)
MIT	19.3766	19.1530	18.5869	19.1188	19.5624	19.8592	19.9566	19.9455	19.7583	19.1775	18.4212	19.0686 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3766	19.1530	18.5869	19.1188	19.5624	19.8592	19.9566	19.9455	19.7583	19.1775	18.4212	19.0686 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9826	0.9632	0.9250	0.8633	0.7594	0.5957	0.4275	0.4716	0.6965	0.8862	0.9600	0.9849 (94)
Useful gains	1485.6547	1831.4715	2003.3407	2082.2755	1933.5198	1495.0269	1031.0908	1070.8563	1488.9341	1638.2969	1495.1664	1393.5848 (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	4982.7545	4699.7215	3976.4540	3325.9959	2553.8713	1692.2439	1080.0357	1138.7991	1827.2965	2786.1729	3692.4239	4870.0536 (97)
Space heating kWh	2601.8423	1927.4640	1467.9963	895.4787	461.5415	0.0000	0.0000	0.0000	0.0000	854.0197	1582.0254	2586.4928 (98a)
Space heating requirement - total per year (kWh/year)												12376.8606
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	2601.8423	1927.4640	1467.9963	895.4787	461.5415	0.0000	0.0000	0.0000	0.0000	854.0197	1582.0254	2586.4928 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12376.8606
Space heating per m2										(98c) / (4) =		39.9627 (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 %)												295.0093 (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	2601.8423	1927.4640	1467.9963	895.4787	461.5415	0.0000	0.0000	0.0000	0.0000	854.0197	1582.0254	2586.4928 (98)
Space heating efficiency (main heating system 1)	295.0093	295.0093	295.0093	295.0093	295.0093	0.0000	0.0000	295.0000	0.0000	295.0093	295.0093	295.0093 (210)
Space heating fuel (main heating system)	881.9526	653.3570	497.6102	303.5425	156.4498	0.0000	0.0000	0.0000	0.0000	289.4891	536.2629	876.7496 (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	352.4107	311.7066	330.6494	288.8272	278.8463	249.9678	245.4553	255.7264	259.1713	290.6071	311.0725	348.2556 (64)
Efficiency of water heater												160.7577 (216)
(217)m	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577 (217)
Fuel for water heating, kWh/month	219.2185	193.8983	205.6818	179.6662	173.4575	155.4935	152.6865	159.0756	161.2186	180.7734	193.5039	216.6338 (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	64.1376	51.4535	46.3282	33.9420	26.2178	21.4202	23.9168	31.0879	40.3801	52.9809	59.8418	65.9202 (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)												

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(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												4195.4138	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												160.7577	
Water heating fuel used												2191.3076	(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)												517.6269	(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												6904.3483	(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	4195.4138	0.1553	651.7441	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2191.3076	0.1410	309.0225	(264)
Space and water heating			960.7666	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	517.6269	0.1443	74.7096	(268)
Total CO2, kg/year			1035.4761	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3400	(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	4195.4138	1.5751	6608.1951	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2191.3076	1.5215	3333.9742	(278)
Space and water heating			9942.1693	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	517.6269	1.5338	793.9535	(282)
Total Primary energy kWh/year			10736.1228	(286)
Dwelling Primary energy Rate (DPER)			34.6700	(287)

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

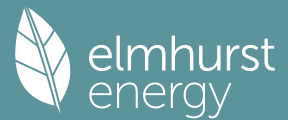
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	122.5100 (1b)	x 2.4500 (2b)	= 300.1495 (1b) - (3b)	
First floor	140.1000 (1c)	x 3.0000 (2c)	= 420.3000 (1c) - (3c)	
Second floor	47.1000 (1d)	x 3.0000 (2d)	= 141.3000 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	309.7100			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 861.7495 (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)	
Infiltation due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0464 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2964 (18)
Number of sides sheltered		2 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$
$$(21) = (18) \times (20) = 0.2520 \quad (21)$$

	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	0.3212	0.3149	0.3086	0.2772	0.2709	0.2394	0.2394	0.2331	0.2520	0.2709	0.2834	0.2960	(22b)
	0.5516	0.5496	0.5476	0.5384	0.5367	0.5286	0.5286	0.5272	0.5317	0.5367	0.5402	0.5438	(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			2.1000	1.0000	2.1000			(26a)
TER Opening Type			40.4900	1.1450	46.3626			(27)
TER Roof Window			1.9200	1.1450	2.8018			(27a)
Ground Floor			122.5100	0.1300	15.9263			(28a)
Above Garage			37.2000	0.1300	4.8360			(28b)
Cavity Wall	228.1100	38.4800	189.6300	0.1800	34.1334			(29a)
Stud / Timber Walls	92.5800	6.0000	86.5800	0.1800	15.5844			(29a)
Slope Roof	64.2600	1.9200	62.3400	0.1100	6.8574			(30)
Flat Ceilings	36.9000		36.9000	0.1100	4.0590			(30)
Between 1st & 2nd Floors	67.4000		67.4000	0.1100	7.4140			(30)
Dormer Roofs	4.7700		4.7700	0.1100	0.5247			(30)
Total net area of external elements Aum(A, m2)			653.7300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	142.4896		(33)

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

120.9864 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	34.5000	0.0500	1.7250	
E2 Other lintels (including other steel lintels)	70.0000	0.0500	3.5000	
E4 Jamb	77.6000	0.0900	6.9840	
E16 Corner (normal)	68.6000	0.0600	4.1160	
E10 Eaves (insulation at ceiling level)	38.5000	0.0400	1.5400	
E11 Eaves (insulation at rafter level)	38.6000	-0.0900	-3.4740	
E17 Corner (inverted - internal area greater than external area)	31.7000	0.0500	1.5850	
E3 Sill	46.7000	0.1600	7.4720	
E5 Ground floor (normal)	88.6000	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	16.6000	0.0800	1.3280	
E14 Flat roof				

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

25.6240 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 168.1136 (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	156.8620	156.2923	155.7338	153.1105	152.6197	150.3349	150.3349	149.9118	151.2150	152.6197	153.6126	154.6506	(38)
Heat transfer coeff	324.9756	324.4058	323.8473	321.2241	320.7333	318.4485	318.4485	318.0254	319.3285	320.7333	321.7262	322.7642	(39)
Average = Sum(39)m / 12 =												321.2217	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0493	1.0475	1.0456	1.0372	1.0356	1.0282	1.0282	1.0268	1.0311	1.0356	1.0388	1.0421	(40)
HLP (average)												1.0372	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1446 (42)
Hot water usage for mixer showers	76.9437	75.7874	74.1024	70.8785	68.4994	65.8462	64.3381	66.0103	67.8434	70.6921	73.9853	76.6489	(42a)
Hot water usage for baths	33.2115	32.7183	32.0237	30.7430	29.7841	28.7207	28.1464	28.8361	29.5871	30.7249	32.0319	33.0993	(42b)
Hot water usage for other uses	46.8334	45.1303	43.4273	41.7243	40.0212	38.3182	38.3182	40.0212	41.7243	43.4273	45.1303	46.8334	(42c)
Average daily hot water use (litres/day)												144.3076	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.9886	153.6360	149.5534	143.3458	138.3047	132.8851	130.8027	134.8676	139.1547	144.8443	151.1475	156.5815	(44)
Energy conte	248.6316	218.7757	229.8581	196.2333	186.1847	163.3977	158.1945	166.9943	171.5917	196.5523	215.3374	245.1689	(45)
Energy content (annual)										Total = Sum(45)m =		2396.9201	
Distribution loss (46)m = 0.15 x (45)m	37.2947	32.8164	34.4787	29.4350	27.9277	24.5097	23.7292	25.0491	25.7388	29.4829	32.3006	36.7753	(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 30.6236 31.6444 (56)

If cylinder contains dedicated solar storage

31.6444 28.5820 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 30.6236 31.6444 30.6236 31.6444 30.6236 31.6444 (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 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 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

303.5384 268.3689 284.7649 249.3689 241.0915 216.5333 213.1013 221.9011 224.7273 251.4591 268.4730 300.0756 (62)

WWHRS -35.1755 -31.1095 -32.5760 -26.9742 -25.1390 -21.5116 -20.1637 -21.4421 -22.2568 -26.2383 -29.7248 -34.5241 (63a)

PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)

Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)

FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

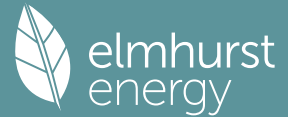
Output from w/h 268.3629 237.2594 252.1888 222.3946 215.9524 195.0217 192.9375 200.4590 202.4705 225.2209 238.7482 265.5516 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2716.5676 (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)

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Heat gains from water heating, kWh/month
126.5954 112.4175 120.3532 107.7560 105.8318 96.8382 96.5251 99.4510 99.5627 109.2791 114.1082 125.4441 (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	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	252.9130	280.0108	252.9130	261.3434	252.9130	261.3434	252.9130	252.9130	261.3434	252.9130	261.3434	252.9130	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.0806	470.9171	458.7294	432.7831	400.0307	369.2480	348.6833	343.8469	356.0346	381.9808	414.7332	445.5159	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	(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)	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	(71)
Water heating gains (Table 5)	170.1552	167.2879	161.7651	149.6612	142.2471	134.4975	129.7380	133.6707	138.2816	146.8805	158.4836	168.6076	(72)
Total internal gains	962.3171	991.3841	946.5758	916.9560	868.3591	835.2573	801.5026	800.5989	825.8279	854.9426	907.7285	940.2048	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				13.1300	10.6334	0.6300		0.7000		0.7700		42.6686 (74)
East				1.3200	19.6403	0.6300		0.7000		0.7700		7.9231 (76)
South				26.0400	46.7521	0.6300		0.7000		0.7700		372.0605 (78)
North				0.9600	15.2954	0.6300		0.7000		1.0000		5.8279 (82)
East				0.4800	25.9287	0.6300		0.7000		1.0000		4.9397 (82)
West				0.4800	26.0000	0.6300		0.7000		1.0000		4.9533 (82)
Solar gains	438.3732	737.4021	994.5434	1225.0145	1377.6886	1373.4361	1321.5224	1204.5911	1072.7482	810.1058	523.1244	376.5505 (83)
Total gains	1400.6902	1728.7862	1941.1191	2141.9705	2246.0477	2208.6934	2123.0250	2005.1901	1898.5760	1665.0484	1430.8529	1316.7553 (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	32.0286	32.0849	32.1402	32.4027	32.4523	32.6851	32.6851	32.7286	32.5950	32.4523	32.3521	32.2481	
alpha	3.1352	3.1390	3.1427	3.1602	3.1635	3.1790	3.1790	3.1819	3.1730	3.1635	3.1568	3.1499	
util living area	0.9893	0.9790	0.9625	0.9255	0.8547	0.7293	0.5873	0.6308	0.8136	0.9411	0.9812	0.9912	(86)
MIT	18.5618	18.8687	19.2922	19.8465	20.3558	20.7405	20.9063	20.8797	20.6003	19.9283	19.1428	18.5103	(87)
Th 2	20.0425	20.0440	20.0455	20.0525	20.0538	20.0599	20.0599	20.0610	20.0575	20.0538	20.0511	20.0484	(88)
util rest of house	0.9874	0.9752	0.9555	0.9103	0.8221	0.6633	0.4858	0.5325	0.7611	0.9262	0.9772	0.9896	(89)
MIT 2	17.1526	17.5444	18.0830	18.7837	19.4062	19.8467	20.0050	19.9858	19.7014	18.8953	17.9007	17.0904	(90)
Living area fraction	17.2443	17.6305	18.1617	18.8528	19.4679	19.9048	20.0636	20.0439	19.7599	18.9625	17.9815	17.1827	(92)
MIT	17.2443	17.6305	18.1617	18.8528	19.4679	19.9048	20.0636	20.0439	19.7599	18.9625	17.9815	17.1827	(93)
Temperature adjustment												0.0000	
adjusted MIT	17.2443	17.6305	18.1617	18.8528	19.4679	19.9048	20.0636	20.0439	19.7599	18.9625	17.9815	17.1827	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9612	0.9359	0.8852	0.7976	0.6510	0.4862	0.5305	0.7413	0.9027	0.9640	0.9820	(94)
Useful gains	1370.6460	1661.6370	1816.7275	1896.1390	1791.5161	1437.8876	1032.3086	1063.8026	1407.4582	1503.0614	1379.4035	1293.0050	(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	4206.5677	4129.8640	3776.5975	3197.0726	2491.4297	1689.3030	1102.9824	1158.8492	1807.3558	2682.1200	3500.8662	4190.3552	(97)
Space heating kWh	2109.9258	1658.6485	1458.1433	936.6721	520.7357	0.0000	0.0000	0.0000	0.0000	877.2195	1527.4532	2155.6286	(98a)
Space heating requirement - total per year (kWh/year)												11244.4267	
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	2109.9258	1658.6485	1458.1433	936.6721	520.7357	0.0000	0.0000	0.0000	0.0000	877.2195	1527.4532	2155.6286	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11244.4267	
Space heating per m2												36.3063	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2109.9258	1658.6485	1458.1433	936.6721	520.7357	0.0000	0.0000	0.0000	0.0000	877.2195	1527.4532	2155.6286	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	2285.9434	1797.0190	1579.7868	1014.8127	564.1774	0.0000	0.0000	0.0000	0.0000	950.4004	1654.8788	2335.4589	(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)

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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	268.3629	237.2594	252.1888	222.3946	215.9524	195.0217	192.9375	200.4590	202.4705	225.2209	238.7482	265.5516 (64)
Efficiency of water heater (217)m	87.6841	87.5641	87.3474	86.9191	85.9582	79.8000	79.8000	79.8000	79.8000	86.8001	87.4665	79.8000 (216)
Fuel for water heating, kWh/month	306.0565	270.9551	288.7192	255.8640	251.2298	244.3881	241.7763	251.2017	253.7224	259.4708	272.9595	302.7437 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	52.5503	42.1578	37.9584	27.8100	21.4812	17.5503	19.5959	25.4715	33.0849	43.4092	49.0306	54.0109 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-123.7388	-162.8032	-218.3691	-228.2997	-232.1952	-211.4611	-208.3630	-203.0168	-192.3548	-177.0252	-131.5973	-108.3524 (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	-110.1081	-225.4590	-437.4625	-642.4440	-836.1600	-835.8104	-826.3802	-706.0175	-525.7947	-317.8644	-145.3968	-87.5926 (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												12182.4775 (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												3199.0871 (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)												424.1112 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-7894.0669 (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												7997.6089 (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	12182.4775	0.2100	2558.3203 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3199.0871	0.2100	671.8083 (264)
Space and water heating			3230.1286 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	424.1112	0.1443	61.2124 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2197.5767	0.1362	-299.2419
PV Unit electricity exported	-5696.4902	0.1266	-720.9459
Total			-1020.1878 (269)
Total CO2, kg/year			2283.0824 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.3700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	12182.4775	1.1300	13766.1995 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3199.0871	1.1300	3614.9684 (278)
Space and water heating			17381.1679 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	424.1112	1.5338	650.5159 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2197.5767	1.5033	-3303.7146
PV Unit electricity exported	-5696.4902	0.4646	-2646.5283
Total			-5950.2429 (283)
Total Primary energy kWh/year			12211.5418 (286)
Target Primary Energy Rate (TPER)			39.4300 (287)

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

1. Overall dwelling characteristics

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	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	122.5100 (1b)	x 2.4500 (2b)	= 300.1495 (1b) - (3b)
First floor	140.1000 (1c)	x 3.0000 (2c)	= 420.3000 (1c) - (3c)
Second floor	47.1000 (1d)	x 3.0000 (2d)	= 141.3000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	309.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	861.7495 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0464 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2964 (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) = 0.2520 (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	0.3212	0.3149	0.3086	0.2772	0.2709	0.2394	0.2394	0.2331	0.2520	0.2709	0.2834	0.2960 (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	0.5516	0.5496	0.5476	0.5384	0.5367	0.5286	0.5286	0.5272	0.5317	0.5367	0.5402	0.5438 (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			2.1000	1.4000	2.9400		(26a)
Windows			40.4900	1.3258	53.6799		(27)
Roof Windows			1.9200	1.3258	2.5455		(27a)
House to Garage Door			1.8900	1.4000	2.6460		(26)
Ground Floor			122.5100	0.1200	14.7012	110.0000	13476.1000 (28a)
Above Garage			37.2000	0.1800	6.6960	20.0000	744.0000 (28b)
Cavity Wall	228.1100	38.4800	189.6300	0.1700	32.2371	60.0000	11377.8000 (29a)
Stud / Timber Walls	92.5800	6.0000	86.5800	0.1700	14.7186	9.0000	779.2200 (29a)
Slope Roof	64.2600	1.9200	62.3400	0.1400	8.7276	9.0000	561.0600 (30)
Flat Ceilings	36.9000		36.9000	0.1400	5.1660	9.0000	332.1000 (30)
Between 1st & 2nd Floors	67.4000		67.4000	0.1400	9.4360	9.0000	606.6000 (30)
Dormer Roofs	4.7700		4.7700	0.1400	0.6678	9.0000	42.9300 (30)
Total net area of external elements Aum(A, m ²)			653.7300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		154.1617		(33)
Main dwelling							
Internal Walls			552.3800			9.0000	4971.4200 (32c)
First Floor			122.5100			18.0000	2205.1800 (32d)
Second Floor			47.1000			18.0000	847.8000 (32d)
Ground Floor Ceiling			122.5100			9.0000	1102.5900 (32e)
First Floor Ceiling			47.1000			9.0000	423.9000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	37470.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		120.9864 (35)

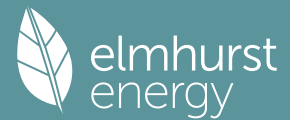
List of Thermal Bridges	Length	Psi-value	Total
K1 Element	34.5000	0.0380	1.3110
E2 Other lintels (including other steel lintels)	70.0000	0.0160	1.1200
E4 Jamb	77.6000	0.0390	3.0264
E16 Corner (normal)	68.6000	0.0610	4.1846
E10 Eaves (insulation at ceiling level)	38.5000	0.0100	0.3850
E11 Eaves (insulation at rafter level)	38.6000	-0.0910	-3.5126
E17 Corner (inverted - internal area greater than external area)	31.7000	0.0210	0.6657
E3 Sill	46.7000	0.0370	1.7279
E5 Ground floor (normal)	88.6000	0.0030	0.2658
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	16.6000	0.1600	2.6560
E14 Flat roof			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.5178 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	168.6795 (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	156.8620	156.2923	155.7338	153.1105	152.6197	150.3349	150.3349	149.9118	151.2150	152.6197	153.6126	154.6506 (38)
Heat transfer coeff												
	325.5415	324.9717	324.4132	321.7900	321.2992	319.0144	319.0144	318.5913	319.8944	321.2992	322.2921	323.3301 (39)
Average = Sum(39)m / 12 =												321.7876

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0511	1.0493	1.0475	1.0390	1.0374	1.0300	1.0300	1.0287	1.0329	1.0374	1.0406	1.0440 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.1446 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	33.2115	32.7183	32.0237	30.7430	29.7841	28.7207	28.1464	28.8361	29.5871	30.7249	32.0319	33.0993 (42b)
Hot water usage for other uses	46.8334	45.1303	43.4273	41.7243	40.0212	38.3182	38.3182	40.0212	41.7243	43.4273	45.1303	46.8334 (42c)
Average daily hot water use (litres/day)												73.3681 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	80.0449	77.8486	75.4510	72.4673	69.8053	67.0389	66.4646	68.8573	71.3114	74.1522	77.1623	79.9326 (44)
Distribution loss (46)m = 0.15 x (45)m	126.7716	110.8554	115.9654	99.2041	93.9714	82.4322	80.3832	85.2598	87.9340	100.6238	109.9318	125.1552 (45)
Water storage loss (or HIU 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 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	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	107.7558	94.2271	98.5706	84.3235	79.8757	70.0674	68.3257	72.4708	74.7439	85.5302	93.4420	106.3819 (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	107.7558	94.2271	98.5706	84.3235	79.8757	70.0674	68.3257	72.4708	74.7439	85.5302	93.4420	106.3819 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											1035.7146 (64)
Electric shower(s)	61.6191	54.9031	59.9521	57.2116	58.2851	55.5983	57.4516	58.2851	57.2116	59.9521	58.8248	61.6191 (64a)
Heat gains from water heating, kWh/month	42.3437	37.2826	39.6307	35.3838	34.5402	31.4164	31.4443	32.6890	32.9889	36.3706	38.0667	42.0002 (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	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	252.9130	280.0108	252.9130	261.3434	252.9130	261.3434	252.9130	252.9130	261.3434	252.9130	261.3434	252.9130 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.0806	470.9171	458.7294	432.7831	400.0307	369.2480	348.6833	343.8469	356.0346	381.9808	414.7332	445.5159 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228 (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)	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821 (71)
Water heating gains (Table 5)	56.9136	55.4800	53.2670	49.1441	46.4250	43.6339	42.2639	43.9368	45.8179	48.8852	52.8704	56.4519 (72)
Total internal gains	846.0755	876.5762	835.0777	813.4390	769.5370	744.3937	714.0285	710.8650	733.3642	753.9473	799.1154	825.0491 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				13.1300	10.6334		0.7600		0.7000		0.7700		51.4732 (74)
East				1.3200	19.6403		0.7600		0.7000		0.7700		9.5580 (76)
South				26.0400	46.7521		0.7600		0.7000		0.7700		448.8349 (78)
North				0.9600	15.2954		0.7600		0.7000		1.0000		7.0305 (82)
East				0.4800	25.9287		0.7600		0.7000		1.0000		5.9590 (82)
West				0.4800	26.0000		0.7600		0.7000		1.0000		5.9754 (82)
Solar gains	528.8311	889.5645	1199.7666	1477.7953	1661.9735	1656.8436	1594.2175	1453.1576	1294.1089	977.2705	631.0707	454.2514	(83)
Total gains	1374.9066	1766.1406	2034.8443	2291.2342	2431.5105	2401.2373	2308.2460	2164.0225	2027.4731	1731.2178	1430.1860	1279.3006	(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	31.9730	32.0290	32.0842	32.3457	32.3951	32.6271	32.6271	32.6705	32.5374	32.3951	32.2953	32.1916
alpha	3.1315	3.1353	3.1389	3.1564	3.1597	3.1751	3.1751	3.1780	3.1692	3.1597	3.1530	3.1461
util living area	0.9899	0.9778	0.9578	0.9132	0.8313	0.6957	0.5519	0.5984	0.7914	0.9355	0.9812	0.9919 (86)
MIT	18.5426	18.8852	19.3369	19.9097	20.4146	20.7746	20.9213	20.8964	20.6344	19.9572	19.1388	18.4841 (87)
Th 2	20.0410	20.0425	20.0440	20.0510	20.0523	20.0584	20.0584	20.0595	20.0560	20.0523	20.0496	20.0468 (88)
util rest of house	0.9881	0.9738	0.9500	0.8962	0.7956	0.6279	0.4529	0.5011	0.7360	0.9194	0.9773	0.9904 (89)
MIT 2	17.7703	18.1113	18.5585	19.1219	19.5987	19.9166	20.0232	20.0100	19.8055	19.1770	18.3703	17.7161 (90)
Living area fraction	17.8205	18.1616	18.6091	19.1731	19.6517	19.9724	20.0816	20.0677	19.8594	19.2277	18.4202	17.7660 (91)
MIT	17.8205	18.1616	18.6091	19.1731	19.6517	19.9724	20.0816	20.0677	19.8594	19.2277	18.4202	17.7660 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8205	18.1616	18.6091	19.1731	19.6517	19.9724	20.0816	20.0677	19.8594	19.2277	18.4202	17.7660 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9819	0.9631	0.9346	0.8766	0.7780	0.6210	0.4555	0.5020	0.7226	0.9012	0.9676	0.9852	(94)
Useful gains	1349.9753	1700.9240	1901.6857	2008.5502	1891.8330	1491.2557	1051.4107	1086.4014	1465.0479	1560.2204	1383.8521	1260.4084	(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	4401.4817	4309.6419	3928.3632	3305.7857	2554.8888	1713.8698	1110.6860	1168.4869	1842.4068	2772.0816	3648.4244	4386.3102	(97)
Space heating kWh	2270.3208	1753.0584	1507.8480	934.0096	493.3135	0.0000	0.0000	0.0000	0.0000	901.6247	1630.4920	2325.6709	(98a)
Space heating requirement - total per year (kWh/year)												11816.3379	
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	2270.3208	1753.0584	1507.8480	934.0096	493.3135	0.0000	0.0000	0.0000	0.0000	901.6247	1630.4920	2325.6709	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11816.3379	
Space heating per m2												38.1529	(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	2998.7352	2360.7064	2421.2937	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7112	0.7884	0.7553	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2132.7491	1861.1180	1828.7543	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2647.6865	2545.8738	2387.4973	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	370.7550	509.4583	415.7048	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area /	(4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	92.6887	127.3646	103.9262	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												323.9795	(107)
Energy for space heating												38.1529	(99)
Energy for space cooling												1.0461	(108)
Total												39.1990	(109)
Fabric Energy Efficiency (DFEE)												39.2	(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	122.5100 (1b)	x 2.4500 (2b)	= 300.1495 (1b) - (3b)
First floor	140.1000 (1c)	x 3.0000 (2c)	= 420.3000 (1c) - (3c)
Second floor	47.1000 (1d)	x 3.0000 (2d)	= 141.3000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	309.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	861.7495 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0464 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2964 (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) = 0.2520 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750 (22a)
Adj infilt rate	0.3212 0.3149 0.3086 0.2772 0.2709 0.2394 0.2394 0.2331 0.2520 0.2709 0.2834 0.2960 (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	0.5516 0.5496 0.5476 0.5384 0.5367 0.5286 0.5286 0.5272 0.5317 0.5367 0.5402 0.5438 (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								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Semi-glazed door			2.1000	1.0000	2.1000			(26a)
TER Opening Type			40.4900	1.1450	46.3626			(27)
TER Roof Window			1.9200	1.1450	2.8018			(27a)
Ground Floor			122.5100	0.1300	15.9263			(28a)
Above Garage			37.2000	0.1300	4.8360			(28b)
Cavity Wall	228.1100	38.4800	189.6300	0.1800	34.1334			(29a)
Stud / Timber Walls	92.5800	6.0000	86.5800	0.1800	15.5844			(29a)
Slope Roof	64.2600	1.9200	62.3400	0.1100	6.8574			(30)
Flat Ceilings	36.9000		36.9000	0.1100	4.0590			(30)
Between 1st & 2nd Floors	67.4000		67.4000	0.1100	7.4140			(30)
Dormer Roofs	4.7700		4.7700	0.1100	0.5247			(30)
Total net area of external elements Aum(A, m2)			653.7300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	142.4896		(33)

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

120.9864 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	34.5000	0.0500	1.7250
E2 Other lintels (including other steel lintels)	70.0000	0.0500	3.5000
E4 Jamb	77.6000	0.0900	6.9840
E16 Corner (normal)	68.6000	0.0600	4.1160
E10 Eaves (insulation at ceiling level)	38.5000	0.0400	1.5400
E11 Eaves (insulation at rafter level)	38.6000	-0.0900	-3.4740
E17 Corner (inverted - internal area greater than external area)	31.7000	0.0500	1.5850
E3 Sill	46.7000	0.1600	7.4720
E5 Ground floor (normal)	88.6000	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	16.6000	0.0800	1.3280
E14 Flat roof			

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

25.6240 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 168.1136 (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	156.8620	156.2923	155.7338	153.1105	152.6197	150.3349	150.3349	149.9118	151.2150	152.6197	153.6126	154.6506
Heat transfer coeff	324.9756	324.4058	323.8473	321.2241	320.7333	318.4485	318.4485	318.0254	319.3285	320.7333	321.7262	322.7642
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0493	1.0475	1.0456	1.0372	1.0356	1.0282	1.0282	1.0268	1.0311	1.0356	1.0388	1.0421
HLP (average)												1.0372
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

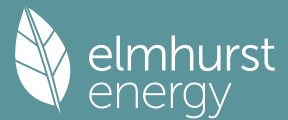
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1446 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	33.2115	32.7183	32.0237	30.7430	29.7841	28.7207	28.1464	28.8361	29.5871	30.7249	32.0319	33.0993	(42b)
Hot water usage for other uses	46.8334	45.1303	43.4273	41.7243	40.0212	38.3182	38.3182	40.0212	41.7243	43.4273	45.1303	46.8334	(42c)
Average daily hot water use (litres/day)													73.3681 (43)
Daily hot water use	80.0449	77.8486	75.4510	72.4673	69.8053	67.0389	66.4646	68.8573	71.3114	74.1522	77.1623	79.9326	(44)
Energy conte	126.7716	110.8554	115.9654	99.2041	93.9714	82.4322	80.3832	85.2598	87.9340	100.6238	109.9318	125.1552	(45)
Energy content (annual)										Total = Sum(45)m =		1218.4878	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	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	107.7558	94.2271	98.5706	84.3235	79.8757	70.0674	68.3257	72.4708	74.7439	85.5302	93.4420	106.3819	(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	107.7558	94.2271	98.5706	84.3235	79.8757	70.0674	68.3257	72.4708	74.7439	85.5302	93.4420	106.3819	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1035.7146	(64)
Electric shower(s)	61.6191	54.9031	59.9521	57.2116	58.2851	55.5983	57.4516	58.2851	57.2116	59.9521	58.8248	61.6191	(64a)
Heat gains from water heating, kWh/month	42.3437	37.2826	39.6307	35.3838	34.5402	31.4164	31.4443	32.6890	32.9889	36.3706	38.0667	42.0002	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	157.2276	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	252.9130	280.0108	252.9130	261.3434	252.9130	261.3434	252.9130	252.9130	261.3434	252.9130	261.3434	252.9130	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.0806	470.9171	458.7294	432.7831	400.0307	369.2480	348.6833	343.8469	356.0346	381.9808	414.7332	445.5159	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	38.7228	(69)

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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)	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821 (71)
Water heating gains (Table 5)	56.9136	55.4800	53.2670	49.1441	46.4250	43.6339	42.2639	43.9368	45.8179	48.8852	52.8704	56.4519 (72)
Total internal gains	846.0755	876.5762	835.0777	813.4390	769.5370	744.3937	714.0285	710.8650	733.3642	753.9473	799.1154	825.0491 (73)

6. Solar gains

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

North					13.1300	10.6334	0.6300	0.7000				0.7700	42.6686 (74)
East					1.3200	19.6403	0.6300	0.7000				0.7700	7.9231 (76)
South					26.0400	46.7521	0.6300	0.7000				0.7700	372.0605 (78)
North					0.9600	15.2954	0.6300	0.7000				1.0000	5.8279 (82)
East					0.4800	25.9287	0.6300	0.7000				1.0000	4.9397 (82)
West					0.4800	26.0000	0.6300	0.7000				1.0000	4.9533 (82)

Solar gains	438.3732	737.4021	994.5434	1225.0145	1377.6886	1373.4361	1321.5224	1204.5911	1072.7482	810.1058	523.1244	376.5505 (83)	
Total gains	1284.4487	1613.9783	1829.6211	2038.4535	2147.2256	2117.8298	2035.5509	1915.4561	1806.1124	1564.0531	1322.2397	1201.5997 (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	32.0286	32.0849	32.1402	32.4027	32.4523	32.6851	32.6851	32.7286	32.5950	32.4523	32.3521	32.2481
alpha	3.1352	3.1390	3.1427	3.1602	3.1635	3.1790	3.1790	3.1819	3.1730	3.1635	3.1568	3.1499
util living area	0.9917	0.9825	0.9678	0.9336	0.8672	0.7459	0.6055	0.6505	0.8298	0.9495	0.9849	0.9932 (86)
MIT	18.4942	18.8044	19.2332	19.7986	20.3208	20.7216	20.8976	20.8682	20.5724	19.8786	19.0812	18.4428 (87)
Th 2	20.0425	20.0440	20.0455	20.0525	20.0538	20.0599	20.0599	20.0610	20.0575	20.0538	20.0511	20.0484 (88)
util rest of house	0.9901	0.9794	0.9616	0.9198	0.8363	0.6812	0.5031	0.5520	0.7797	0.9363	0.9816	0.9920 (89)
MIT 2	17.7232	18.0325	18.4586	19.0183	19.5183	19.8800	20.0126	19.9960	19.7577	19.1038	18.3146	17.6760 (90)
Living area fraction	17.7734	18.0827	18.5090	19.0690	19.5705	19.9348	20.0702	20.0527	19.8107	19.1542	18.3644	17.7258 (92)
MIT	17.7734	18.0827	18.5090	19.0690	19.5705	19.9348	20.0702	20.0527	19.8107	19.1542	18.3644	17.7258 (93)
Temperature adjustment												0.0000
adjusted MIT	17.7734	18.0827	18.5090	19.0690	19.5705	19.9348	20.0702	20.0527	19.8107	19.1542	18.3644	17.7258 (93)

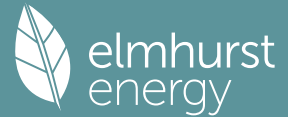
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1264.9147	1565.9540	1734.8614	1837.5018	1754.9746	1421.8107	1026.5039	1055.4325	1379.8880	1438.2982	1286.8817	1186.5623 (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	4378.5133	4276.5455	3889.0677	3266.5428	2524.3384	1698.8462	1105.0746	1161.6568	1823.5764	2743.6214	3624.0568	4365.6592 (97)
Space heating kWh	2316.5174	1821.5175	1602.7295	1028.9095	572.4067	0.0000	0.0000	0.0000	0.0000	971.1605	1682.7660	2365.2481 (98a)
Space heating requirement - total per year (kWh/year)												12361.2552
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	2316.5174	1821.5175	1602.7295	1028.9095	572.4067	0.0000	0.0000	0.0000	0.0000	971.1605	1682.7660	2365.2481 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12361.2552
Space heating per m2										(98c) / (4) =		39.9124 (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	2993.4157	2356.5187	2416.9928	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6568	0.7395	0.7050	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1966.1868	1742.7311	1703.9908	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2320.8213	2231.2442	2100.2362	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	255.3368	363.4537	294.8066	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.8342	90.8634	73.7016	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												228.3993 (107)
Energy for space heating												39.9124 (99)
Energy for space cooling												0.7375 (108)
Total												40.6498 (109)
Fabric Energy Efficiency (TFEE)												40.6 (109)

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1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	122.5100 (1b)	x 2.4500 (2b)	= 300.1495 (1b) - (3b)
First floor	140.1000 (1c)	x 3.0000 (2c)	= 420.3000 (1c) - (3c)
Second floor	47.1000 (1d)	x 3.0000 (2d)	= 141.3000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	309.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 861.7495 (5)

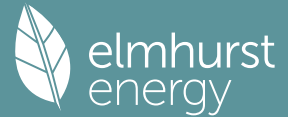
2. Ventilation rate

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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	80.0000 / (5) =	
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	5.0000 (17)	
Number of sides sheltered	0.3428 (18)	
Shelter factor	2 (19)	
Infiltration rate adjusted to include shelter factor	(20) = 1 - [0.075 x (19)] =	
	(21) = (18) x (20) =	
Wind speed	Jan 5.1000	Feb 5.0000
Wind factor	1.2750	1.2500
Adj infilt rate	0.3715	0.3643
Effective ac	0.5690	0.5663

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			2.1000	1.4000	2.9400		(26a)
Windows			40.4900	1.3258	53.6799		(27)
Roof Windows			1.9200	1.3258	2.5455		(27a)
House to Garage Door			1.8900	1.4000	2.6460		(26)
Ground Floor			122.5100	0.1200	14.7012	110.0000	13476.1000 (28a)
Above Garage			37.2000	0.1800	6.6960	20.0000	744.0000 (28b)
Cavity Wall	228.1100	38.4800	189.6300	0.1700	32.2371	60.0000	11377.8000 (29a)
Stud / Timber Walls	92.5800	6.0000	86.5800	0.1700	14.7186	9.0000	779.2200 (29a)
Slope Roof	64.2600	1.9200	62.3400	0.1400	8.7276	9.0000	561.0600 (30)
Flat Ceilings	36.9000		36.9000	0.1400	5.1660	9.0000	332.1000 (30)
Between 1st & 2nd Floors	67.4000		67.4000	0.1400	9.4360	9.0000	606.6000 (30)
Dormer Roofs	4.7700		4.7700	0.1400	0.6678	9.0000	42.9300 (30)
Total net area of external elements Aum(A, m ²)			653.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	154.1617		(33)
Main dwelling							
Internal Walls			552.3800			9.0000	4971.4200 (32c)
First Floor			122.5100			18.0000	2205.1800 (32d)
Second Floor			47.1000			18.0000	847.8000 (32d)
Ground Floor Ceiling			122.5100			9.0000	1102.5900 (32e)
First Floor Ceiling			47.1000			9.0000	423.9000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	37470.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							120.9864 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				34.5000	0.0380	1.3110	
E4 Jamb				70.0000	0.0160	1.1200	
E16 Corner (normal)				77.6000	0.0390	3.0264	
E10 Eaves (insulation at ceiling level)				68.6000	0.0610	4.1846	
E11 Eaves (insulation at rafter level)				38.5000	0.0100	0.3850	
E17 Corner (inverted - internal area greater than external area)				38.6000	-0.0910	-3.5126	
E3 Sill				31.7000	0.0210	0.6657	
E5 Ground floor (normal)				46.7000	0.0370	1.7279	
E6 Intermediate floor within a dwelling				88.6000	0.0030	0.2658	
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	
E14 Flat roof				16.6000	0.1600	2.6560	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.5178 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	168.6795 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 161.8174	Feb 161.0552	Mar 160.3081	Apr 156.7989	May 156.1423	Jun 153.0860	Jul 153.0860
Heat transfer coeff	330.4969	329.7347	328.9875	325.4784	324.8218	321.7654	321.7654
Average = Sum(39)m / 12 =							
HLP	Jan 1.0671	Feb 1.0647	Mar 1.0622	Apr 1.0509	May 1.0488	Jun 1.0389	Jul 1.0389
HLP (average)							
Days in mont	31	28	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.1446 (42)
Hot water usage for mixer showers	105.7976	104.2077	101.8908	97.4580	94.1866	90.5385	88.4648	90.7642	93.2846	97.2017	101.7297	105.3923 (42a)
Hot water usage for baths	33.2115	32.7183	32.0237	30.7430	29.7841	28.7207	28.1464	28.8361	29.5871	30.7249	32.0319	33.0993 (42b)
Hot water usage for other uses	46.8334	45.1303	43.4273	41.7243	40.0212	38.3182	38.3182	40.0212	41.7243	43.4273	45.1303	46.8334 (42c)
Average daily hot water use (litres/day)												170.9100 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	185.8425	182.0563	177.3419	169.9253	163.9919	157.5774	154.9294	159.6215	164.5960	171.3538	178.8920	185.3249 (44)
Energy content (annual)	294.3291	259.2458	272.5678	232.6192	220.7647	193.7598	187.3737	197.6448	202.9633	232.5255	254.8645	290.1740 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											2838.8322
Water storage loss (or HIU loss):	44.1494	38.8869	40.8852	34.8929	33.1147	29.0640	28.1061	29.6467	30.4445	34.8788	38.2297	43.5261 (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	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	352.4107	311.7066	330.6494	288.8272	278.8463	249.9678	245.4553	255.7264	259.1713	290.6071	311.0725	348.2556 (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	352.4107	311.7066	330.6494	288.8272	278.8463	249.9678	245.4553	255.7264	259.1713	290.6071	311.0725	348.2556 (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 per year (kWh/year) = Sum(64)m =											3522.6962 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	144.3297	128.1679	137.0941	122.3123	119.8695	109.3915	108.7670	112.1822	112.4517	123.7800	129.7088	142.9481 (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	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.2755	65.0826	52.9287	40.0705	29.9531	25.2877	27.3243	35.5171	47.6710	60.5292	70.6466	75.3120	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	695.6427	702.8613	684.6707	645.9450	597.0608	551.1165	520.4229	513.2043	531.3949	570.1206	619.0048	664.9491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	(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)	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	(71)
Water heating gains (Table 5)	193.9915	190.7260	184.2662	169.8782	161.1150	151.9327	146.1923	150.7825	156.1829	166.3710	180.1512	192.1346	(72)
Total internal gains	1082.8126	1078.5728	1041.7686	975.7966	908.0318	848.2398	813.8423	819.4068	855.1517	916.9238	989.7055	1052.2986	(73)

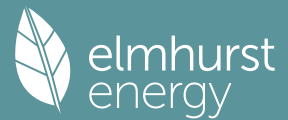
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				13.1300	10.6334	0.7600	0.7000	0.7700	51.4732 (74)			
East				1.3200	19.6403	0.7600	0.7000	0.7700	9.5580 (76)			
South				26.0400	46.7521	0.7600	0.7000	0.7700	448.8349 (78)			
North				0.9600	15.2954	0.7600	0.7000	1.0000	7.0305 (82)			
East				0.4800	25.9287	0.7600	0.7000	1.0000	5.9590 (82)			
West				0.4800	26.0000	0.7600	0.7000	1.0000	5.9754 (82)			
Solar gains	528.8311	889.5645	1199.7666	1477.7953	1661.9735	1656.8436	1594.2175	1294.1089	977.2705	631.0707	454.2514 (83)	
Total gains	1611.6438	1968.1373	2241.5352	2453.5918	2570.0053	2505.0834	2408.0598	2272.5644	2149.2606	1894.1943	1620.7761	1506.5500 (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	31.4936	31.5664	31.6381	31.9792	32.0438	32.3482	32.3482	32.4052	32.2303	32.0438	31.9133	31.7780
alpha	3.0996	3.1044	3.1092	3.1319	3.1363	3.1565	3.1565	3.1603	3.1487	3.1363	3.1276	3.1185
util living area	0.9843	0.9706	0.9470	0.9002	0.8156	0.6806	0.5370	0.5801	0.7725	0.9212	0.9739	0.9872 (86)
Living	19.1313	19.3707	19.7080	20.1197	20.4835	20.7417	20.8470	20.8305	20.6448	20.1629	19.5662	19.0893
Non living	17.8128	18.1182	18.5458	19.0656	19.5044	19.7974	19.8945	19.8840	19.6988	19.1285	18.3762	17.7648
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	20.2489	20.0268	19.7080	20.1197	20.4835	20.7417	20.8470	20.8305	20.6448	20.1629	19.5662	19.9178 (87)
Th 2	20.0278	20.0298	20.0318	20.0411	20.0429	20.0510	20.0510	20.0525	20.0479	20.0429	20.0393	20.0356 (88)

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util rest of house	0.9815	0.9655	0.9375	0.8812	0.7779	0.6120	0.4386	0.4832	0.7148	0.9024	0.9685	0.9849 (89)
MIT 2	19.3340	19.1098	18.5458	19.0656	19.5044	19.7974	19.8945	19.8840	19.6988	19.1285	18.3762	19.0333 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.3935	19.1694	18.6214	19.1341	19.5681	19.8588	19.9565	19.9455	19.7603	19.1958	18.4536	19.0908 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3935	19.1694	18.6214	19.1341	19.5681	19.8588	19.9565	19.9455	19.7603	19.1958	18.4536	19.0908 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9600	0.9194	0.8590	0.7561	0.5965	0.4281	0.4713	0.6944	0.8808	0.9561	0.9821	(94)
Useful gains	1578.4440	1889.4332	2060.9066	2107.7132	1943.2324	1494.1976	1030.8442	1070.9986	1492.4686	1668.4294	1549.6497	1479.6400	(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	4988.3408	4705.1180	3987.7933	3330.9820	2555.7335	1692.0925	1079.9912	1138.8248	1827.9635	2792.0893	3702.9663	4877.3241	(97)
Space heating kWh	2536.9632	1892.1401	1433.6036	880.7536	455.7009	0.0000	0.0000	0.0000	0.0000	836.0030	1550.3879	2527.8770	(98a)
Space heating requirement - total per year (kWh/year)												12113.4293	
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	2536.9632	1892.1401	1433.6036	880.7536	455.7009	0.0000	0.0000	0.0000	0.0000	836.0030	1550.3879	2527.8770	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12113.4293	
Space heating per m2											(98c) / (4) =	39.1122	(99)

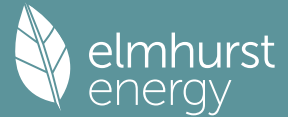
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													295.0093 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	2536.9632	1892.1401	1433.6036	880.7536	455.7009	0.0000	0.0000	0.0000	0.0000	836.0030	1550.3879	2527.8770	(98)
Space heating efficiency (main heating system 1)	295.0093	295.0093	295.0093	295.0093	295.0093	0.0000	0.0000	0.0000	0.0000	295.0093	295.0093	295.0093	(210)
Space heating fuel (main heating system)	859.9604	641.3832	485.9520	298.5511	154.4700	0.0000	0.0000	0.0000	0.0000	283.3819	525.5387	856.8804	(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	352.4107	311.7066	330.6494	288.8272	278.8463	249.9678	245.4553	255.7264	259.1713	290.6071	311.0725	348.2556	(64)
Efficiency of water heater	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	(216)
Fuel for water heating, kWh/month	219.2185	193.8983	205.6818	179.6662	173.4575	155.4935	152.6865	159.0756	161.2186	180.7734	193.5039	216.6338	(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	64.1376	51.4535	46.3282	33.9420	26.2178	21.4202	23.9168	31.0879	40.3801	52.9809	59.8418	65.9202	(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												4106.1178	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												160.7577	
Water heating fuel used												2191.3076	(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)												517.6269	(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												6815.0523	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
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Space heating - main system 1	4106.1178	16.4900	677.0988 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2191.3076	16.4900	361.3466 (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	517.6269	16.4900	85.3567 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1123.8021 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1406 (257)
SAP value		81.5115
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	4106.1178	0.1553	637.7962 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	2191.3076	0.1410	309.0225 (264)	
Space and water heating			946.8186 (265)	
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)	
Energy for lighting	517.6269	0.1443	74.7096 (268)	
Total CO2, kg/year			1021.5282 (272)	
CO2 emissions per m2			3.3000 (273)	
EI value			96.1409	
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	122.5100 (1b)	x 2.4500 (2b)	= 300.1495 (1b) - (3b)	
First floor	140.1000 (1c)	x 3.0000 (2c)	= 420.3000 (1c) - (3c)	
Second floor	47.1000 (1d)	x 3.0000 (2d)	= 141.3000 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	309.7100		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	861.7495 (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	Air changes per hour	
Pressure test	80.0000 / (5) =	0.0928 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	5.0000 (17)
Infiltration rate		0.3428 (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) =	0.2914 (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	0.2987	0.2768	0.2841	0.2550	0.2623	0.2331	0.2404	0.2258	0.2258	0.2477	0.2404	0.2696	(22b)
Effective ac	0.5446	0.5383	0.5404	0.5325	0.5344	0.5272	0.5289	0.5255	0.5255	0.5307	0.5289	0.5363	(25)

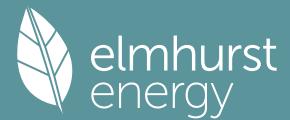
3. Heat losses and heat loss parameter

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			2.1000	1.4000	2.9400			(26a)
Windows			40.4900	1.3258	53.6799			(27)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												3.1446 (42)
Hot water usage for mixer showers	105.7976	104.2077	101.8908	97.4580	94.1866	90.5385	88.4648	90.7642	93.2846	97.2017	101.7297	105.3923 (42a)
Hot water usage for baths	33.2115	32.7183	32.0237	30.7430	29.7841	28.7207	28.1464	28.8361	29.5871	30.7249	32.0319	33.0993 (42b)
Hot water usage for other uses	46.8334	45.1303	43.4273	41.7243	40.0212	38.3182	38.3182	40.0212	41.7243	43.4273	45.1303	46.8334 (42c)
Average daily hot water use (litres/day)												170.9100 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	185.8425	182.0563	177.3419	169.9253	163.9919	157.5774	154.9294	159.6215	164.5960	171.3538	178.8920	185.3249 (44)
Energy content (annual)	294.3291	259.2458	272.5678	232.6192	220.7647	193.7598	187.3737	197.6448	202.9633	232.5255	254.8645	290.1740 (45)
Distribution loss (46)m = 0.15 x (45)m												2838.8322
	44.1494	38.8869	40.8852	34.8929	33.1147	29.0640	28.1061	29.6467	30.4445	34.8788	38.2297	43.5261 (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	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	352.4107	311.7066	330.6494	288.8272	278.8463	249.9678	245.4553	255.7264	259.1713	290.6071	311.0725	348.2556 (62)
WVHRS	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	352.4107	311.7066	330.6494	288.8272	278.8463	249.9678	245.4553	255.7264	259.1713	290.6071	311.0725	348.2556 (64)
	Total per year (kWh/year) = Sum(64)m =											3522.6962 (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	144.3297	128.1679	137.0941	122.3123	119.8695	109.3915	108.7670	112.1822	112.4517	123.7800	129.7088	142.9481 (65)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119 (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)	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821 (71)
Water heating gains (Table 5)	193.9915	190.7260	184.2662	169.8782	161.1150	151.9327	146.1923	150.7825	156.1829	166.3710	180.1512	192.1346 (72)
Total internal gains	1082.8126	1078.5728	1041.7686	975.7966	908.0318	848.2398	813.8423	819.4068	855.1517	916.9238	989.7055	1052.2986 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				13.1300	12.7500		0.7600		0.7000		0.7700		61.7190 (74)
East				1.3200	23.7835		0.7600		0.7000		0.7700		11.5743 (76)
South				26.0400	54.0600		0.7600		0.7000		0.7700		518.9936 (78)
North				0.9600	18.1387		0.7600		0.7000		1.0000		8.3374 (82)
East				0.4800	31.5802		0.7600		0.7000		1.0000		7.2579 (82)
West				0.4800	32.0000		0.7600		0.7000		1.0000		7.3544 (82)
Solar gains	615.2366	919.9054	1214.8582	1531.9016	1692.1438	1782.6820	1711.7879	1590.5058	1400.8708	1067.0582	723.1266		531.6732 (83)
Total gains	1698.0492	1998.4782	2256.6268	2507.6982	2600.1756	2630.9218	2525.6303	2409.9126	2256.0225	1983.9820	1712.8320		1583.9719 (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	32.1694	32.3482	32.2899	32.5152	32.4609	32.6700	32.6198	32.7188	32.7188	32.5682	32.6198	32.4052
alpha	3.1446	3.1565	3.1527	3.1677	3.1641	3.1780	3.1747	3.1813	3.1813	3.1712	3.1747	3.1603
util living area	0.9803	0.9669	0.9404	0.8837	0.7817	0.6142	0.4546	0.4929	0.7328	0.9010	0.9671	0.9839 (86)
Living	19.2813	19.4865	19.8178	20.2221	20.5733	20.7976	20.8739	20.8648	20.7000	20.2768	19.6962	19.2325
Non living	18.0169	18.2801	18.6967	19.2014	19.6163	19.8579	19.9203	19.9173	19.7668	19.2776	18.5540	17.9592
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	8	0	0	0	0	0	0	0	0	0	0	0
16 / 9	23	23	0	0	0	0	0	0	0	0	0	31
MIT	20.2778	20.0256	19.8178	20.2221	20.5733	20.7976	20.8739	20.8648	20.7000	20.2768	19.6962	19.9989 (87)
Th 2	20.0462	20.0510	20.0495	20.0554	20.0540	20.0595	20.0582	20.0608	20.0608	20.0568	20.0582	20.0525 (88)
util rest of house	0.9768	0.9612	0.9296	0.8617	0.7375	0.5381	0.3519	0.3902	0.6694	0.8775	0.9603	0.9811 (89)
MIT 2	19.3817	19.0927	18.6967	19.2014	19.6163	19.8579	19.9203	19.9173	19.7668	19.2776	18.5540	19.1286 (90)
Living area fraction									fLA = Living area / (4) =			0.0650 (91)
MIT	19.4400	19.1534	18.7696	19.2678	19.6786	19.9190	19.9823	19.9789	19.8275	19.3426	18.6283	19.1852 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4400	19.1534	18.7696	19.2678	19.6786	19.9190	19.9823	19.9789	19.8275	19.3426	18.6283	19.1852 (93)

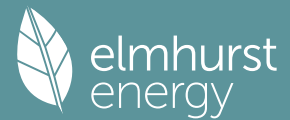
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9742	0.9545	0.9109	0.8394	0.7173	0.5257	0.3432	0.3807	0.6514	0.8551	0.9463	0.9779 (94)
Ext temp.	1654.1614	1907.6116	2055.6401	2105.0297	1865.1852	1382.9794	866.6982	917.5298	1469.5363	1696.5772	1620.8324	1548.8929 (95)
Heat loss rate W	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)
Space heating kWh	4736.8163	4457.5416	3793.8966	3158.8093	2333.8580	1503.4417	887.7994	947.6610	1726.5850	2634.2538	3550.8746	4652.6299 (97)
Space heating requirement - total per year (kWh/year)	2293.4953	1713.5530	1293.2628	758.7213	348.6925	0.0000	0.0000	0.0000	0.0000	697.6314	1389.6304	2309.1803 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2293.4953	1713.5530	1293.2628	758.7213	348.6925	0.0000	0.0000	0.0000	0.0000	697.6314	1389.6304	2309.1803 (98c)
Space heating per m2										(98c) / (4) =		34.8848 (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 %)	293.5755 (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
Space heating efficiency (main heating system 1)	2293.4953	1713.5530	1293.2628	758.7213	348.6925	0.0000	0.0000	0.0000	0.0000	697.6314	1389.6304	2309.1803 (98)
Space heating fuel (main heating system)	293.5755	293.5755	293.5755	293.5755	293.5755	0.0000	0.0000	0.0000	0.0000	293.5755	293.5755	293.5755 (210)
Space heating efficiency (main heating system 2)	781.2285	583.6840	440.5214	258.4417	118.7744	0.0000	0.0000	0.0000	0.0000	237.6327	473.3469	786.5713 (211)
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 (212)
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 (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	352.4107	311.7066	330.6494	288.8272	278.8463	249.9678	245.4553	255.7264	259.1713	290.6071	311.0725	348.2556 (64)
Efficiency of water heater (217)m	160.7805	160.7805	160.7805	160.7805	160.7805	160.7805	160.7805	160.7805	160.7805	160.7805	160.7805	160.7805 (216)

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Fuel for water heating, kWh/month	219.1875	193.8709	205.6527	179.6407	173.4329	155.4715	152.6649	159.0531	161.1958	180.7478	193.4765	216.6032	(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	64.1376	51.4535	46.3282	33.9420	26.2178	21.4202	23.9168	31.0879	40.3801	52.9809	59.8418	65.9202	(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												3680.2008	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												160.7805	
Water heating fuel used												2190.9976	(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)												517.6269	(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												6388.8254	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3680.2008	28.4300	1046.2811	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2190.9976	28.4300	622.9006	(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	517.6269	28.4300	147.1613	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1816.3431	(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	3680.2008	0.1556	572.7694	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2190.9976	0.1410	308.9787	(264)
Space and water heating			881.7481	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	517.6269	0.1443	74.7096	(268)
Total CO2, kg/year			956.4577	(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	3680.2008	1.5762	5800.6419	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2190.9976	1.5215	3333.5026	(278)
Space and water heating			9134.1445	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	517.6269	1.5338	793.9535	(282)
Total Primary energy kWh/year			9928.0980	(286)

SAP 10 EPC IMPROVEMENTS

Plot 1

Current energy efficiency rating:	B 82
Current environmental impact rating:	A 96

N Solar water heating	Recommended
U Solar photovoltaic panels	Recommended
V2 Wind turbine	Not applicable
Recommended measures:	
N Solar water heating	SAP change + 1.0 Cost change -£ 118 CO2 change -52 kg (5.4%)
U Solar photovoltaic panels	SAP change + 2.9 Cost change -£ 318 CO2 change -150 kg (16.6%)

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Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£118	0.17 kg/m ²	B 83	A 96
Solar photovoltaic panels	£318	0.48 kg/m ²	B 85	A 97
Total Savings	£436	0.65 kg/m ²		

Potential energy efficiency rating: B 85
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	£1816	£1698	£118
Space heating	£1046	£1070	-£23
Water heating	£623	£481	£142
Lighting	£147	£147	£0
Generated (PV)	-£0	-£318	£318
Total cost of fuels	£1816	£1380	£436
Total cost of uses	£1816	£1380	£437
Delivered energy	21 kWh/m ²	16 kWh/m ²	5 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	0.8 tonnes	0.2 tonnes
CO2 emissions per m ²	3 kg/m ²	2 kg/m ²	1 kg/m ²
Primary energy	32 kWh/m ²	25 kWh/m ²	7 kWh/m ²

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	122.5100 (1b)	x 2.4500 (2b)	= 300.1495 (1b) - (3b)
First floor	140.1000 (1c)	x 3.0000 (2c)	= 420.3000 (1c) - (3c)
Second floor	47.1000 (1d)	x 3.0000 (2d)	= 141.3000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	309.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	861.7495 (5)

2. Ventilation rate

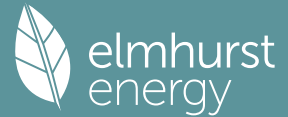
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.0928 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3428 (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) = 0.2914 (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	0.3715	0.3643	0.3570	0.3206	0.3133	0.2768	0.2768	0.2696	0.2914	0.3133	0.3278	0.3424 (22b)
Effective ac	0.5690	0.5663	0.5637	0.5514	0.5491	0.5383	0.5383	0.5363	0.5425	0.5491	0.5537	0.5586 (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			2.1000	1.4000	2.9400		(26a)
Windows			40.4900	1.3258	53.6799		(27)
Roof Windows			1.9200	1.3258	2.5455		(27a)
House to Garage Door			1.8900	1.4000	2.6460		(26)
Ground Floor			122.5100	0.1200	14.7012	110.0000	13476.1000 (28a)
Above Garage			37.2000	0.1800	6.6960	20.0000	744.0000 (28b)
Cavity Wall	228.1100	38.4800	189.6300	0.1700	32.2371	60.0000	11377.8000 (29a)
Stud / Timber Walls	92.5800	6.0000	86.5800	0.1700	14.7186	9.0000	779.2200 (29a)
Slope Roof	64.2600	1.9200	62.3400	0.1400	8.7276	9.0000	561.0600 (30)
Flat Ceilings	36.9000		36.9000	0.1400	5.1660	9.0000	332.1000 (30)

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Between 1st & 2nd Floors	67.4000	67.4000	0.1400	9.4360	9.0000	606.6000 (30)
Dormer Roofs	4.7700	4.7700	0.1400	0.6678	9.0000	42.9300 (30)
Total net area of external elements Aum(A, m2)		653.7300				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	154.1617			(33)
Main dwelling						
Internal Walls		552.3800			9.0000	4971.4200 (32c)
First Floor		122.5100			18.0000	2205.1800 (32d)
Second Floor		47.1000			18.0000	847.8000 (32d)
Ground Floor Ceiling		122.5100			9.0000	1102.5900 (32e)
First Floor Ceiling		47.1000			9.0000	423.9000 (32e)

Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
 List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	34.5000	0.0380	1.3110
E4 Jamb	70.0000	0.0160	1.1200
E16 Corner (normal)	77.6000	0.0390	3.0264
E10 Eaves (insulation at ceiling level)	68.6000	0.0610	4.1846
E11 Eaves (insulation at rafter level)	38.5000	0.0100	0.3850
E17 Corner (inverted - internal area greater than external area)	38.6000	-0.0910	-3.5126
E3 Sill	31.7000	0.0210	0.6657
E5 Ground floor (normal)	46.7000	0.0370	1.7279
E6 Intermediate floor within a dwelling	88.6000	0.0030	0.2658
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
E14 Flat roof	16.6000	0.1600	2.6560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal Bridges
 Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	161.8174	161.0552	160.3081	156.7989	156.1423	153.0860	153.0860	152.5200	154.2632	156.1423	157.4705	158.8591 (38)
Heat transfer coeff												
	330.4969	329.7347	328.9875	325.4784	324.8218	321.7654	321.7654	321.1994	322.9427	324.8218	326.1500	327.5386 (39)
Average = Sum(39)m / 12 =												325.4752

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0671	1.0647	1.0622	1.0509	1.0488	1.0389	1.0389	1.0371	1.0427	1.0488	1.0531	1.0576 (40)
HLP (average)												1.0509
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1446 (42)
Hot water usage for mixer showers													
	105.7976	104.2077	101.8908	97.4580	94.1866	90.5385	88.4648	90.7642	93.2846	97.2017	101.7297	105.3923	(42a)
Hot water usage for baths													
	33.2115	32.7183	32.0237	30.7430	29.7841	28.7207	28.1464	28.8361	29.5871	30.7249	32.0319	33.0993	(42b)
Hot water usage for other uses													
	46.8334	45.1303	43.4273	41.7243	40.0212	38.3182	38.3182	40.0212	41.7243	43.4273	45.1303	46.8334	(42c)
Average daily hot water use (litres/day)												170.9100	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	185.8425	182.0563	177.3419	169.9253	163.9919	157.5774	154.9294	159.6215	164.5960	171.3538	178.8920	185.3249	(44)
Energy conte	294.3291	259.2458	272.5678	232.6192	220.7647	193.7598	187.3737	197.6448	202.9633	232.5255	254.8645	290.1740	(45)
Energy content (annual)										Total =	Sum(45)m =	2838.8322	
Distribution loss (46)m = 0.15 x (45)m	44.1494	38.8869	40.8852	34.8929	33.1147	29.0640	28.1061	29.6467	30.4445	34.8788	38.2297	43.5261	(46)
Water storage loss (or HIU loss):													

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	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
 WWHRS
 PV diverter

Aperture area of solar collector	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H1)
Zero-loss collector efficiency	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H2)
Collector linear heat loss coefficient	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H3)
Collector 2nd order heat loss coefficient	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H4)
Collector loop efficiency	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H5)
Incidence angle modifier	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H6)
Overshading factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H8)
Overall heat loss coefficient of system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H10)
Heat loss coefficient of collector loop	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H11)
Dedicated solar storage volume	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H12)
Effective solar volume	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H14)
Reference volume	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H15)
Storage tank correction coefficient	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H16)
Heat delivered to hot water	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H24)
Heat delivered to space heating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (H29)

Solar input
 Solar input
 FGHS
 Output from w/h

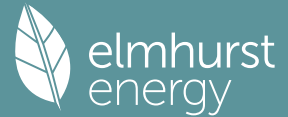
Solar input	-0.0000	-16.1612	-60.0324	-83.9853	-111.7792	-103.3901	-102.8118	-88.7552	-59.9828	-28.9246	-0.0000	-0.0000 (63c)
FGHS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	352.4107	295.5454	269.2213	198.0883	154.2728	133.9710	129.6166	154.8747	193.7857	260.2868	311.0725	348.2556 (64)

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

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	144.3297	128.1679	135.9775	116.9094	109.6341	99.3062	98.3455	102.5050	108.1294	122.6634	129.7088	142.9481 (65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732	188.6732 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	73.2755	65.0826	52.9287	40.0705	29.9531	25.2877	27.3243	35.5171	47.6710	60.5292	70.6466	75.3120 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	695.6427	702.8613	684.6707	645.9450	597.0608	551.1165	520.4229	513.2043	531.3949	570.1206	619.0048	664.9491 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119 (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)												
	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821 (71)
Water heating gains (Table 5)												
	193.9915	190.7260	182.7654	162.3742	147.3576	137.9252	132.1848	137.7755	150.1797	164.8702	180.1512	192.1346 (72)
Total internal gains												
	1082.8126	1078.5728	1040.2678	968.2926	894.2745	834.2323	799.8349	806.3999	849.1485	915.4230	989.7055	1052.2986 (73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor		W	
			W/m2		or Table 6b		or Table 6c		Table 6d			
North	13.1300		10.6334		0.7600		0.7000		0.7700		51.4732 (74)	
East	1.3200		19.6403		0.7600		0.7000		0.7700		9.5580 (76)	
South	26.0400		46.7521		0.7600		0.7000		0.7700		448.8349 (78)	
North	0.9600		15.2954		0.7600		0.7000		1.0000		7.0305 (82)	
East	0.4800		25.9287		0.7600		0.7000		1.0000		5.9590 (82)	
West	0.4800		26.0000		0.7600		0.7000		1.0000		5.9754 (82)	
Solar gains	528.8311	889.5645	1199.7666	1477.7953	1661.9735	1656.8436	1594.2175	1453.1576	1294.1089	977.2705	631.0707	454.2514 (83)
Total gains	1611.6438	1968.1373	2240.0344	2446.0878	2556.2480	2491.0759	2394.0523	2259.5574	2143.2574	1892.6935	1620.7761	1506.5500 (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	31.4936	31.5664	31.6381	31.9792	32.0438	32.3482	32.3482	32.4052	32.2303	32.0438	31.9133	31.7780
alpha	3.0996	3.1044	3.1092	3.1319	3.1363	3.1565	3.1565	3.1603	3.1487	3.1363	3.1276	3.1185
util living area	0.9843	0.9706	0.9471	0.9009	0.8174	0.6830	0.5395	0.5826	0.7735	0.9214	0.9739	0.9872 (86)
Living	19.1313	19.3707	19.7075	20.1174	20.4805	20.7401	20.8462	20.8296	20.6437	20.1624	19.5662	19.0893
Non living	17.8128	18.1182	18.5451	19.0628	19.5011	19.7959	19.8941	19.8834	19.6977	19.1279	18.3762	17.7648
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	20.2489	20.0268	19.7075	20.1174	20.4805	20.7401	20.8462	20.8296	20.6437	20.1624	19.5662	19.9178 (87)
Th 2	20.0278	20.0298	20.0318	20.0411	20.0429	20.0510	20.0510	20.0525	20.0479	20.0429	20.0393	20.0356 (88)
util rest of house	0.9815	0.9655	0.9376	0.8820	0.7799	0.6144	0.4409	0.4856	0.7159	0.9025	0.9685	0.9849 (89)
MIT 2	19.3340	19.1098	18.5451	19.0628	19.5011	19.7959	19.8941	19.8834	19.6977	19.1279	18.3762	19.0333 (90)
Living area fraction									FLA = Living area / (4) =			0.0650 (91)
MIT	19.3935	19.1694	18.6207	19.1314	19.5648	19.8573	19.9560	19.9449	19.7593	19.1952	18.4536	19.0908 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3935	19.1694	18.6207	19.1314	19.5648	19.8573	19.9560	19.9449	19.7593	19.1952	18.4536	19.0908 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9794	0.9600	0.9195	0.8598	0.7580	0.5988	0.4302	0.4735	0.6955	0.8810	0.9561	0.9821 (94)
Useful gains	1578.4440	1889.4332	2059.7760	2103.1566	1937.6354	1491.5665	1029.9952	1069.8990	1490.6152	1667.4446	1549.6497	1479.6400 (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	4988.3408	4705.1180	3987.5704	3330.0891	2554.6606	1691.6121	1079.8381	1138.6260	1827.6138	2791.8960	3702.9663	4877.3241 (97)
Space heating kWh	2536.9632	1892.1401	1434.2790	883.3914	459.0668	0.0000	0.0000	0.0000	0.0000	836.5918	1550.3879	2527.8770 (98a)
Space heating requirement - total per year (kWh/year)												12120.6972
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	2536.9632	1892.1401	1434.2790	883.3914	459.0668	0.0000	0.0000	0.0000	0.0000	836.5918	1550.3879	2527.8770 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12120.6972
Space heating per m2										(98c) / (4) =		39.1356 (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 %)												295.0093 (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	2536.9632	1892.1401	1434.2790	883.3914	459.0668	0.0000	0.0000	0.0000	0.0000	836.5918	1550.3879	2527.8770 (98)
Space heating efficiency (main heating system 1)	295.0093	295.0093	295.0093	295.0093	295.0093	0.0000	0.0000	0.0000	0.0000	295.0093	295.0093	295.0093 (210)
Space heating fuel (main heating system)	859.9604	641.3832	486.1810	299.4453	155.6109	0.0000	0.0000	0.0000	0.0000	283.5815	525.5387	856.8804 (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)

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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	352.4107	295.5454	269.2213	198.0883	154.2728	133.9710	129.6166	154.8747	193.7857	260.2868	311.0725	348.2556	(64)
Efficiency of water heater	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	(216)
(217)m	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	160.7577	(217)
Fuel for water heating, kWh/month	219.2185	183.8452	167.4702	123.2216	95.9660	83.3372	80.6285	96.3405	120.5452	161.9125	193.5039	216.6338	(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	64.1376	51.4535	46.3282	33.9420	26.2178	21.4202	23.9168	31.0879	40.3801	52.9809	59.8418	65.9202	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.2443	-65.3663	-101.2685	-121.2753	-133.3775	-117.9584	-116.2430	-107.3842	-91.9850	-76.3128	-47.8408	-35.8333	(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												4108.5814	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												160.7577	
Water heating fuel used												1742.6232	(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)												517.6269	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1057.0895	(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												5391.7421	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4108.5814	16.4900	677.5051	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1742.6232	16.4900	287.3586	(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	517.6269	16.4900	85.3567	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1057.0895	16.4900	-174.3141	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-174.3141	(252)
Total energy cost			889.0983	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9024	(257)
SAP value		85.3728	
SAP rating (Section 12)		85	(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	4108.5814	0.1553	638.1368	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1742.6232	0.1446	252.0564	(264)
Space and water heating			890.1932	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	517.6269	0.1443	74.7096	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1057.0895	0.1339	-141.5372	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-141.5372	(269)
Total CO2, kg/year			834.4625	(272)
CO2 emissions per m2			2.6900	(273)
EI value			96.8476	
EI rating			97	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	122.5100 (1b)	x 2.4500 (2b)	= 300.1495 (1b) - (3b)
First floor	140.1000 (1c)	x 3.0000 (2c)	= 420.3000 (1c) - (3c)
Second floor	47.1000 (1d)	x 3.0000 (2d)	= 141.3000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	309.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 861.7495 (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) = 0.0928 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3428 (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) = 0.2914 (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	0.2987	0.2768	0.2841	0.2550	0.2623	0.2331	0.2404	0.2258	0.2258	0.2477	0.2404	0.2696 (22b)
Effective ac	0.5446	0.5383	0.5404	0.5325	0.5344	0.5272	0.5289	0.5255	0.5255	0.5307	0.5289	0.5363 (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			2.1000	1.4000	2.9400		(26a)
Windows			40.4900	1.3258	53.6799		(27)
Roof Windows			1.9200	1.3258	2.5455		(27a)
House to Garage Door			1.8900	1.4000	2.6460		(26)
Ground Floor			122.5100	0.1200	14.7012	110.0000	13476.1000 (28a)
Above Garage			37.2000	0.1800	6.6960	20.0000	744.0000 (28b)
Cavity Wall	228.1100	38.4800	189.6300	0.1700	32.2371	60.0000	11377.8000 (29a)
Stud / Timber Walls	92.5800	6.0000	86.5800	0.1700	14.7186	9.0000	779.2200 (29a)
Slope Roof	64.2600	1.9200	62.3400	0.1400	8.7276	9.0000	561.0600 (30)
Flat Ceilings	36.9000		36.9000	0.1400	5.1660	9.0000	332.1000 (30)
Between 1st & 2nd Floors	67.4000		67.4000	0.1400	9.4360	9.0000	606.6000 (30)
Dormer Roofs	4.7700		4.7700	0.1400	0.6678	9.0000	42.9300 (30)
Total net area of external elements Aum(A, m ²)			653.7300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	154.1617			(33)

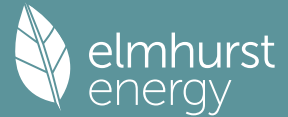
Main dwelling							
Internal Walls			552.3800			9.0000	4971.4200 (32c)
First Floor			122.5100			18.0000	2205.1800 (32d)
Second Floor			47.1000			18.0000	847.8000 (32d)
Ground Floor Ceiling			122.5100			9.0000	1102.5900 (32e)
First Floor Ceiling			47.1000			9.0000	423.9000 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	37470.7000			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K				120.9864			(35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	34.5000	0.0380	1.3110
E2 Other lintels (including other steel lintels)	70.0000	0.0160	1.1200
E4 Jamb	77.6000	0.0390	3.0264
E16 Corner (normal)	68.6000	0.0610	4.1846
E10 Eaves (insulation at ceiling level)	38.5000	0.0100	0.3850
E11 Eaves (insulation at rafter level)	38.6000	-0.0910	-3.5126
E17 Corner (inverted - internal area greater than external area)	31.7000	0.0210	0.6657
E3 Sill	46.7000	0.0370	1.7279
E5 Ground floor (normal)	88.6000	0.0030	0.2658
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	16.6000	0.1600	2.6560
E14 Flat roof			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.5178	(36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	168.6795 (37)

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

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(38)m	Jan 154.8745	Feb 153.0860	Mar 153.6671	Apr 151.4333	May 151.9691	Jun 149.9164	Jul 150.4069	Aug 149.4410	Sep 149.4410	Oct 150.9125	Nov 150.4069	Dec 152.5200	(38)
Heat transfer coeff	323.5540	321.7654	322.3465	320.1127	320.6485	318.5959	319.0864	318.1204	318.1204	319.5920	319.0864	321.1994	(39)
Average = Sum(39)m / 12 =												320.1857	
HLP	Jan 1.0447	Feb 1.0389	Mar 1.0408	Apr 1.0336	May 1.0353	Jun 1.0287	Jul 1.0303	Aug 1.0272	Sep 1.0272	Oct 1.0319	Nov 1.0303	Dec 1.0371	(40)
HLP (average)												1.0338	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1446	(42)
Hot water usage for mixer showers														
105.7976	104.2077	101.8908	97.4580	94.1866	90.5385	88.4648	90.7642	93.2846	97.2017	101.7297	105.3923	105.3923	(42a)	
Hot water usage for baths														
33.2115	32.7183	32.0237	30.7430	29.7841	28.7207	28.1464	28.8361	29.5871	30.7249	32.0319	33.0993	33.0993	(42b)	
Hot water usage for other uses														
46.8334	45.1303	43.4273	41.7243	40.0212	38.3182	38.3182	40.0212	41.7243	43.4273	45.1303	46.8334	46.8334	(42c)	
Average daily hot water use (litres/day)												170.9100	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	185.8425	182.0563	177.3419	169.9253	163.9919	157.5774	154.9294	159.6215	164.5960	171.3538	178.8920	185.3249	(44)	
Energy content	294.3291	259.2458	272.5678	232.6192	220.7647	193.7598	187.3737	197.6448	202.9633	232.5255	254.8645	290.1740	(45)	
Energy content (annual)										Total = Sum(45)m =		2838.8322		
Distribution loss (46)m = 0.15 x (45)m														
44.1494	38.8869	40.8852	34.8929	33.1147	29.0640	28.1061	29.6467	30.4445	34.8788	38.2297	43.5261	43.5261	(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	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	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														
352.4107	311.7066	329.2537	282.0736	266.0520	237.3611	232.4284	243.6299	253.7684	289.2114	311.0725	348.2556	348.2556	(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														
Zero-loss collector efficiency														
Collector linear heat loss coefficient														
Collector 2nd order heat loss coefficient														
Collector loop efficiency														
Incidence angle modifier														
Overshading factor														
Overall heat loss coefficient of system														
Heat loss coefficient of collector loop														
Dedicated solar storage volume														
Effective solar volume														
Reference volume														
Storage tank correction coefficient														
Heat delivered to hot water														
Heat delivered to space heating														
Solar input														
Solar input	-0.0000	-20.1035	-64.3534	-90.9300	-116.4993	-114.3826	-113.7236	-102.2060	-70.6411	-38.6503	-4.3495	-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														
352.4107	291.6030	264.9003	191.1436	149.5527	122.9785	118.7047	141.4239	183.1273	250.5611	306.7230	348.2556	348.2556	(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														
144.3297	128.1679	135.9775	116.9094	109.6341	99.3062	98.3455	102.5050	108.1294	122.6634	129.7088	142.9481	142.9481	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 188.6732	Feb 188.6732	Mar 188.6732	Apr 188.6732	May 188.6732	Jun 188.6732	Jul 188.6732	Aug 188.6732	Sep 188.6732	Oct 188.6732	Nov 188.6732	Dec 188.6732	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
73.2755	65.0826	52.9287	40.0705	29.9531	25.2877	27.3243	35.5171	47.6710	60.5292	70.6466	75.3120	75.3120	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
695.6427	702.8613	684.6707	645.9450	597.0608	551.1165	520.4229	513.2043	531.3949	570.1206	619.0048	664.9491	664.9491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	57.0119	(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)													
-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	-125.7821	(71)
Water heating gains (Table 5)													
193.9915	190.7260	182.7654	162.3742	147.3576	137.9252	132.1848	137.7755	150.1797	164.8702	180.1512	192.1346	192.1346	(72)
Total internal gains													
1082.8126	1078.5728	1040.2678	968.2926	894.2745	834.2323	799.8349	806.3999	849.1485	915.4230	989.7055	1052.2986	1052.2986	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	13.1300	12.7500	0.7600	0.7000	0.7700	61.7190 (74)
East	1.3200	23.7835	0.7600	0.7000	0.7700	11.5743 (76)
South	26.0400	54.0600	0.7600	0.7000	0.7700	518.9936 (78)
North	0.9600	18.1387	0.7600	0.7000	1.0000	8.3374 (82)
East	0.4800	31.5802	0.7600	0.7000	1.0000	7.2579 (82)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	160.7805
Water heating fuel used	1692.6088 (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)	517.6269 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1118.6042 (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	4854.0421 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3682.4106	28.4300	1046.9093 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1692.6088	28.4300	481.2087 (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	517.6269	28.4300	147.1613 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1118.6042	28.4300	-318.0192
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-318.0192 (252)
Total energy cost			1380.0042 (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	3682.4106	0.1556	573.0757 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1692.6088	0.1451	245.6613 (264)
Space and water heating			818.7370 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	517.6269	0.1443	74.7096 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1118.6042	0.1341	-150.0104
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-150.0104 (269)
Total CO2, kg/year			754.5332 (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	3682.4106	1.5761	5803.9849 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1692.6088	1.5369	2601.2943 (278)
Space and water heating			8405.2792 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	517.6269	1.5338	793.9535 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1118.6042	1.4956	-1672.9911
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1672.9911 (283)
Total Primary energy kWh/year			7647.2656 (286)