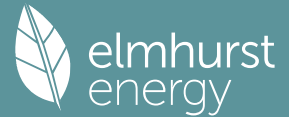


Full SAP Calculation Printout



Property Reference	Maple Tree		Issued on Date	22/02/2024	
Assessment Reference	Design Stage ASHP + PV	Prop Type Ref	Design Stage		
Property	Maple Tree, Woodlands Drive, East Horsley, Surrey, KT24 5AN				
SAP Rating	92 A	DER	1.13	TER	7.63
Environmental	99 A	% DER < TER			85.19
CO ₂ Emissions (t/year)	0.32	DFEE	35.26	TFEE	39.99
Compliance Check	See BREL	% DFEE < TFEE			11.83
% DPER < TPER	60.83	DPER	15.88	TPER	40.53
Assessor Details	Mrs. Faye Mitchell			Assessor ID	V981-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	155.8300 (1b)	x 2.3600 (2b)	= 367.7588 (1b) - (3b)
First floor	150.2700 (1c)	x 2.8500 (2c)	= 428.2695 (1c) - (3c)
Second floor	61.9100 (1d)	x 2.0200 (2d)	= 125.0582 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	368.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 921.0865 (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) = 0.0869 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2869 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2869 (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 infiltr rate	0.3657	0.3586	0.3514	0.3155	0.3084	0.2725	0.2725	0.2653	0.2869	0.3084	0.3227	0.3371 (22b)
Effective ac	0.5669	0.5643	0.5617	0.5498	0.5475	0.5371	0.5371	0.5352	0.5411	0.5475	0.5521	0.5568 (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
Front Door			2.0400	1.2000	2.4480		(26a)
Windows (U _w = 1.00)			51.9100	0.9615	49.9135		(27)
East Velux			1.9200	1.1450	2.1985		(27a)
West Velux			2.8800	1.1450	3.2977		(27a)
Heatloss Floor 1			155.8300	0.1200	18.6996	110.0000	17141.3000 (28a)
External Wall 1	392.4600	53.9500	338.5100	0.1500	50.7765	110.0000	37236.1000 (29a)
Dormer Cheeks	4.7100		4.7100	0.1600	0.7536	18.0000	84.7800 (29a)
Rafter	60.7400	4.8000	55.9400	0.1100	6.1534	9.0000	503.4600 (30)
Flat Main	47.7600		47.7600	0.1100	5.2536	9.0000	429.8400 (30)
Dormer Roofs	1.7500		1.7500	0.1100	0.1925	9.0000	15.7500 (30)
Total net area of external elements A _{um} (A, m ²)			663.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	139.6868		(33)
Internal Wall 1			531.8800			9.0000	4786.9200 (32c)
Internal Floor 1			150.2700			18.0000	2704.8600 (32d)
Internal Floor 2			61.9100			18.0000	1114.3800 (32d)
Internal Ceiling 1			155.8300			9.0000	1402.4700 (32e)
Internal Ceiling 2			61.9100			9.0000	557.1900 (32e)

Full SAP Calculation Printout



Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 65977.0500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.2806 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	37.1200	0.0060	0.2227
E3 Sill	36.1200	0.0190	0.6863
E4 Jamb	77.2400	0.0060	0.4634
E5 Ground floor (normal)	49.4400	0.0930	4.5979
E6 Intermediate floor within a dwelling	104.1600	0.0000	0.0000
E16 Corner (normal)	92.3900	0.0350	3.2337
R1 Head of roof window	6.8600	0.1130	0.7752
R2 Sill of roof window	6.8600	0.1180	0.8095
R3 Jamb of roof window	13.7200	0.8800	12.0736
E17 Corner (inverted - internal area greater than external area)	69.8000	0.0550	3.8390
E11 Eaves (insulation at rafter level)	55.4600	0.0200	1.1092
E13 Gable (insulation at rafter level)	15.6100	0.0670	1.0459

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 28.8563 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 168.5432 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	172.3088	171.5193	170.7456	167.1111	166.4311	163.2656	163.2656	162.6794	164.4849	166.4311	167.8067	169.2449 (38)
Average = Sum(39)m / 12 =	340.8519	340.0625	339.2887	335.6543	334.9743	331.8088	331.8088	331.2226	333.0281	334.9743	336.3499	337.7881 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9262	0.9241	0.9220	0.9121	0.9102	0.9016	0.9016	0.9000	0.9049	0.9102	0.9140	0.9179 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.2203 (42)

Hot water usage for mixer showers 85.1979 83.9176 82.0518 78.4821 75.8477 72.9099 71.2400 73.0916 75.1213 78.2757 81.9221 84.8715 (42a)

Hot water usage for baths 33.7580 33.2567 32.5506 31.2489 30.2741 29.1933 28.6095 29.3106 30.0739 31.2304 32.5590 33.6439 (42b)

Hot water usage for other uses 47.6095 45.8783 44.1470 42.4158 40.6845 38.9533 38.9533 40.6845 42.4158 44.1470 45.8783 47.6095 (42c)

Average daily hot water use (litres/day) 153.1300 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	166.5655	163.0525	158.7495	152.1467	146.8064	141.0564	138.8028	143.0867	147.6110	153.6531	160.3594	166.1249 (44)
Energy content (annual)	263.7990	232.1846	243.9921	208.2813	197.6296	173.4453	167.8699	177.1712	182.0191	208.5059	228.4613	260.1115 (45)
Distribution loss (46)m = 0.15 x (45)m	39.5698	34.8277	36.5988	31.2422	29.6444	26.0168	25.1805	26.5757	27.3029	31.2759	34.2692	39.0167 (46)

Water storage loss:
 Store volume 300.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day):
 Temperature factor from Table 2b 0.5400 (48)
 Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 3172.1467 (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 130.4287 115.7831 123.8429 110.5911 108.4274 99.0082 98.5323 101.6249 101.8590 112.0437 117.3010 129.2026 (65)

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	270.1327	299.0755	270.1327	279.1371	270.1327	279.1371	270.1327	270.1327	279.1371	270.1327	279.1371	270.1327 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	511.2658	516.5712	503.2019	474.7403	438.8126	405.0456	382.4872	377.1819	390.5511	419.0128	454.9405	488.7074 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017 (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)	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137 (71)
Water heating gains (Table 5)	175.3074	172.2963	166.4555	153.5988	145.7357	137.5114	132.4358	136.5927	141.4708	150.5964	162.9180	173.6594 (72)
Total internal gains	1028.0110	1059.2481	1011.0952	978.7813	925.9861	892.9992	856.3608	855.2123	882.4642	911.0470	968.3007	1003.8046 (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
-------	---------	--------------------------	-----------------------------	------------------------------	------------------------	---------

Full SAP Calculation Printout



North	3.0900	10.6334	0.7600	0.7000	0.7700	12.1137 (74)
East	19.7100	19.6403	0.7600	0.7000	0.7700	142.7180 (76)
South	2.5400	46.7521	0.7600	0.7000	0.7700	43.7804 (78)
West	26.5700	19.6403	0.7600	0.7000	0.7700	192.3905 (80)
East	1.9200	26.0000	0.7600	0.7000	1.0000	23.9017 (82)
West	2.8800	26.0000	0.7600	0.7000	1.0000	35.8525 (82)

Solar gains	450.7568	874.4992	1430.8892	2085.6620	2563.5730	2629.6032	2501.1655	2141.9348	1662.6071	1034.4344	560.5213	371.7688 (83)
Total gains	1478.7678	1933.7473	2441.9844	3064.4433	3489.5591	3522.6024	3357.5264	2997.1472	2545.0713	1945.4814	1528.8221	1375.5734 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.7681	53.8929	54.0158	54.6007	54.7115	55.2335	55.2335	55.3312	55.0313	54.7115	54.4878	54.2558
alpha	4.5845	4.5929	4.6011	4.6400	4.6474	4.6822	4.6822	4.6887	4.6688	4.6474	4.6325	4.6171
util living area	0.9985	0.9946	0.9795	0.9165	0.7733	0.5791	0.4298	0.4977	0.7791	0.9694	0.9962	0.9989 (86)
Living	19.6805	19.8772	20.1813	20.5599	20.8091	20.9089	20.9289	20.9244	20.8396	20.4570	19.9942	19.6531
Non living	18.5629	18.8160	19.2037	19.6777	19.9614	20.0645	20.0791	20.0781	20.0040	19.5620	18.9729	18.5332
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	3	0	0	0	0	0	0	0	0	0	31
16 / 9	0	25	31	2	0	0	0	0	0	0	30	0
MIT	21.0000	20.4322	20.5363	20.5727	20.8091	20.9089	20.9289	20.9244	20.8396	20.4570	20.4303	21.0000 (87)
Th 2	20.1453	20.1471	20.1489	20.1572	20.1588	20.1661	20.1661	20.1675	20.1633	20.1588	20.1556	20.1523 (88)
util rest of house	0.9981	0.9932	0.9744	0.8968	0.7281	0.5118	0.3507	0.4123	0.7173	0.9588	0.9951	0.9986 (89)
MIT 2	20.1453	19.6225	19.7317	19.6956	19.9614	20.0645	20.0791	20.0781	20.0040	19.5620	19.6336	20.1523 (90)
Living area fraction										FLA = Living area / (4) =		0.1345 (91)
MIT	20.2602	19.7314	19.8399	19.8135	20.0754	20.1780	20.1933	20.1920	20.1164	19.6823	19.7407	20.2663 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2602	19.7314	19.8399	19.8135	20.0754	20.1780	20.1933	20.1920	20.1164	19.6823	19.7407	20.2663 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9981	0.9924	0.9722	0.8875	0.7233	0.5128	0.3533	0.4149	0.7134	0.9509	0.9944	0.9987 (94)
Useful gains	1476.0203	1919.0836	2374.0835	2719.5764	2523.8935	1806.5471	1186.2544	1243.5307	1815.6557	1850.0348	1520.2241	1373.7554 (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	5440.0743	5043.6084	4526.0772	3663.1648	2805.5472	1850.8451	1192.3050	1255.9802	2003.6235	3042.3496	4251.7139	5427.0129 (97)
Space heating kWh	2949.2562	2099.6807	1601.0833	679.3837	209.5503	0.0000	0.0000	0.0000	0.0000	887.0822	1966.6727	3015.6236 (98a)
Space heating requirement - total per year (kWh/year)												13408.3326
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	2949.2562	2099.6807	1601.0833	679.3837	209.5503	0.0000	0.0000	0.0000	0.0000	887.0822	1966.6727	3015.6236 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13408.3326
Space heating per m2										(98c) / (4) =		36.4347 (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 %)												345.1228 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												65.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2949.2562	2099.6807	1601.0833	679.3837	209.5503	0.0000	0.0000	0.0000	0.0000	887.0822	1966.6727	3015.6236 (98)
Space heating efficiency (main heating system 1)	345.1228	345.1228	345.1228	345.1228	345.1228	0.0000	0.0000	0.0000	0.0000	345.1228	345.1228	345.1228 (210)
Space heating fuel (main heating system)	854.5527	608.3866	463.9170	196.8528	60.7176	0.0000	0.0000	0.0000	0.0000	257.0338	569.8472	873.7828 (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	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059 (64)
Efficiency of water heater (217)m	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336 (216)
Fuel for water heating, kWh/month	186.8772	165.2070	175.2078	153.1537	147.8929	132.6298	130.3598	135.8397	137.6811	154.3008	165.0430	184.7047 (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	66.6481	53.4676	48.1416	35.2706	27.2441	22.2586	24.8529	32.3048	41.9607	55.0547	62.1842	68.5005 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-92.1611	-136.3724	-201.8751	-222.5449	-231.3893	-208.5777	-205.5558	-192.7937	-169.3611	-151.5811	-102.3636	-78.8911 (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	-28.0465	-64.2195	-139.7559	-235.3080	-334.2493	-347.5352	-343.2078	-286.6639	-206.1503	-104.8490	-40.2200	-21.7021 (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)												

Full SAP Calculation Printout



(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												3885.0906	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												169.7336	
Water heating fuel used												1868.8977	(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)												537.8885	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4145.3745	(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												2146.5022	(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	3885.0906	0.1563	607.2081	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1868.8977	0.1410	263.5337	(264)
Space and water heating			870.7417	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	537.8885	0.1443	77.6339	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1993.4669	0.1350	-269.1282	
PV Unit electricity exported	-2151.9076	0.1229	-264.5682	
Total			-533.6964	(269)
Total CO2, kg/year			414.6793	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1300	(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	3885.0906	1.5786	6132.9955	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1868.8977	1.5214	2843.3601	(278)
Space and water heating			8976.3555	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	537.8885	1.5338	825.0314	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1993.4669	1.4990	-2988.2108	
PV Unit electricity exported	-2151.9076	0.4512	-970.8341	
Total			-3959.0448	(283)
Total Primary energy kWh/year			5842.3421	(286)
Dwelling Primary energy Rate (DPER)			15.8800	(287)

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

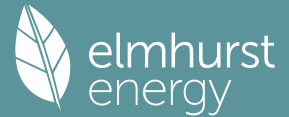
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	155.8300 (1b)	x 2.3600 (2b)	= 367.7588 (1b)	- (3b)
First floor	150.2700 (1c)	x 2.8500 (2c)	= 428.2695 (1c)	- (3c)
Second floor	61.9100 (1d)	x 2.0200 (2d)	= 125.0582 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	368.0100			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	921.0865	(5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
	Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0434 (8)

Full SAP Calculation Printout



Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.2934 (18)
Number of sides sheltered													0 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.2934 (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	0.3741	0.3668	0.3594	0.3228	0.3154	0.2788	0.2788	0.2714	0.2934	0.3154	0.3301	0.3448 (22b)
	0.5700	0.5673	0.5646	0.5521	0.5497	0.5389	0.5389	0.5368	0.5430	0.5497	0.5545	0.5594 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.0400	1.0000	2.0400			(26a)
TER Opening Type (Uw = 1.20)			51.9100	1.1450	59.4389			(27)
East Velux			1.9200	1.5918	3.0562			(27a)
West Velux			2.8800	1.5918	4.5843			(27a)
Heatloss Floor 1			155.8300	0.1300	20.2579			(28a)
External Wall 1	392.4600	53.9500	338.5100	0.1800	60.9318			(29a)
Dormer Cheeks	4.7100		4.7100	0.1800	0.8478			(29a)
Rafter	60.7400	4.8000	55.9400	0.1100	6.1534			(30)
Flat Main	47.7600		47.7600	0.1100	5.2536			(30)
Dormer Roofs	1.7500		1.7500	0.1100	0.1925			(30)
Total net area of external elements Aum(A, m2)			663.2500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 162.7564			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.2806 (35)

List of Thermal Bridges	Length W/K	Psi-value	Total kJ/K	
K1 Element	37.1200	0.0500	1.8560	
E2 Other lintels (including other steel lintels)	36.1200	0.0500	1.8060	
E3 Sill	77.2400	0.0500	3.8620	
E4 Jamb	49.4400	0.1600	7.9104	
E5 Ground floor (normal)	104.1600	0.0000	0.0000	
E6 Intermediate floor within a dwelling	92.3900	0.0900	8.3151	
E16 Corner (normal)	6.8600	0.0800	0.5488	
R1 Head of roof window	6.8600	0.0600	0.4116	
R2 Sill of roof window	13.7200	0.0800	1.0976	
R3 Jamb of roof window	69.8000	-0.0900	-6.2820	
E17 Corner (inverted - internal area greater than external area)	55.4600	0.0400	2.2184	
E11 Eaves (insulation at rafter level)	15.6100	0.0800	1.2488	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.9927 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 185.7491 (37)

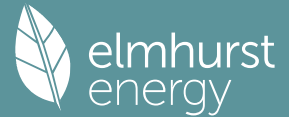
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	173.2511	172.4251	171.6154	167.8125	167.1010	163.7888	163.7888	163.1754	165.0646	167.1010	168.5404	170.0452 (38)
Heat transfer coeff	359.0002	358.1742	357.3645	353.5616	352.8501	349.5379	349.5379	348.9245	350.8137	352.8501	354.2895	355.7943 (39)
Average = Sum(39)m / 12 =												353.5582

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9755	0.9733	0.9711	0.9607	0.9588	0.9498	0.9498	0.9481	0.9533	0.9588	0.9627	0.9668 (40)
HLP (average)												0.9607
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.2203 (42)	
Hot water usage for mixer showers														77.9148 (42a)
Hot water usage for baths														33.6439 (42b)
Hot water usage for other uses														47.6095 (42c)
Average daily hot water use (litres/day)														146.6915 (43)
Daily hot water use	159.5820	156.1740	152.0239	145.7138	140.5893	135.0802	132.9634	137.0956	141.4535	147.2371	153.6445	159.1682 (44)		
Energy conte	252.7389	222.3897	233.6551	199.4749	189.2603	166.0969	160.8077	169.7530	174.4263	199.7993	218.8947	249.2190 (45)		
Energy content (annual)													Total = Sum(45)m = 2436.5158	
Distribution loss (46)m = 0.15 x (45)m	37.9108	33.3585	35.0483	29.9212	28.3890	24.9145	24.1212	25.4629	26.1639	29.9699	32.8342	37.3828 (46)		
Water storage loss:													300.0000 (47)	
Store volume													2.1127 (48)	
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)	
Temperature factor from Table 2b													1.1409 (55)	
Enter (49) or (54) in (55)														
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (56)		
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (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	311.3677	275.3448	292.2839	256.2124	247.8891	222.8344	219.4365	228.3818	231.1639	258.4282	275.6322	307.8478 (62)		
WWHRS	-35.7564	-31.6233	-33.1140	-27.4197	-25.5542	-21.8669	-20.4968	-21.7962	-22.6244	-26.6716	-30.2157	-35.0942 (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	275.6113	243.7215	259.1699	228.7927	222.3349	200.9675	198.9398	206.5855	208.5395	231.7565	245.4165	272.7536 (64)		
Total per year (kWh/year) = Sum(64)m =													2794.5893 (64)	
													2795 (64)	

Full SAP Calculation Printout



Space heating efficiency (main heating system 2)	2871.6524	2234.5901	1837.8057	979.2486	388.5567	0.0000	0.0000	0.0000	0.0000	1131.8798	2081.6684	2925.8033	(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)
Water heating requirement	275.6113	243.7215	259.1699	228.7927	222.3349	200.9675	198.9398	206.5855	208.5395	231.7565	245.4165	272.7536	(64)
Efficiency of water heater (217)m	87.8666	87.7541	87.4922	86.8220	85.1259	79.8000	79.8000	79.8000	79.8000	87.0182	87.6800	79.8000	(216)
Fuel for water heating, kWh/month	313.6702	277.7324	296.2206	263.5192	261.1836	251.8390	249.2980	258.8791	261.3277	266.3312	279.9003	310.3328	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	56.1282	45.0282	40.5429	29.7034	22.9438	18.7453	20.9301	27.2057	35.3375	46.3648	52.3689	57.6882	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-125.0507	-166.6741	-226.4533	-239.9171	-246.5446	-225.4000	-222.0660	-215.0829	-201.7396	-182.7429	-133.7589	-109.2262	(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	-103.1151	-212.1557	-413.4456	-609.6727	-795.8560	-796.4290	-787.5391	-671.8673	-498.9632	-300.1238	-136.5059	-81.9585	(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												14451.2048	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	(216)
Water heating fuel used												3290.2341	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:												86.0000	(231)
Total electricity for the above, kWh/year												452.9870	(232)
Electricity for lighting (calculated in Appendix L)													
Energy saving/generation technologies (Appendices M ,N and O)													
PV generation												-7702.2882	(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												10578.1377	(238)

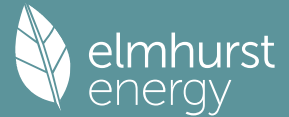
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	14451.2048	0.2100	3034.7530 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3290.2341	0.2100	690.9492 (264)
Space and water heating			3725.7022 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	452.9870	0.1443	65.3800 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2294.6563	0.1359	-311.8038
PV Unit electricity exported	-5407.6318	0.1264	-683.6955
Total			-995.4994 (269)
Total CO2, kg/year			2807.5121 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.6300 (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	14451.2048	1.1300	16329.8615 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3290.2341	1.1300	3717.9645 (278)
Space and water heating			20047.8260 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	452.9870	1.5338	694.8066 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2294.6563	1.5023	-3447.1946
PV Unit electricity exported	-5407.6318	0.4641	-2509.7550
Total			-5956.9496 (283)
Total Primary energy kWh/year			14915.7837 (286)
Target Primary Energy Rate (TPER)			40.5300 (287)

Full SAP Calculation Printout



1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	155.8300 (1b)	x 2.3600 (2b)	= 367.7588 (1b) - (3b)
First floor	150.2700 (1c)	x 2.8500 (2c)	= 428.2695 (1c) - (3c)
Second floor	61.9100 (1d)	x 2.0200 (2d)	= 125.0582 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	368.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 921.0865 (5)

2. Ventilation rate

													m3 per hour	
Number of open chimneys												0 * 80 =	0.0000 (6a)	
Number of open flues												0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)	
Number of blocked chimneys												0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans												4 * 10 =	40.0000 (7a)	
Number of passive vents												0 * 10 =	0.0000 (7b)	
Number of flueless gas fires												0 * 40 =	0.0000 (7c)	
													Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												40.0000 / (5) =	0.0434 (8)	
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50												4.0000 (17)		
Infiltration rate												0.2434 (18)		
Number of sides sheltered												0 (19)		
Shelter factor												(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.2434 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	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	0.3104	0.3043	0.2982	0.2678	0.2617	0.2313	0.2313	0.2252	0.2434	0.2617	0.2739	0.2860	(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	0.5482	0.5463	0.5445	0.5359	0.5342	0.5267	0.5267	0.5254	0.5296	0.5342	0.5375	0.5409	(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							
Front Door			2.0400	1.2000	2.4480		(26a)							
Windows (Uw = 1.00)			51.9100	0.9615	49.9135		(27)							
East Velux			1.9200	1.1450	2.1985		(27a)							
West Velux			2.8800	1.1450	3.2977		(27a)							
Heatloss Floor 1			155.8300	0.1200	18.6996	110.0000	17141.3000 (28a)							
External Wall 1	392.4600	53.9500	338.5100	0.1500	50.7765	110.0000	37236.1000 (29a)							
Dormer Cheeks	4.7100		4.7100	0.1600	0.7536	18.0000	84.7800 (29a)							
Rafter	60.7400	4.8000	55.9400	0.1100	6.1534	9.0000	503.4600 (30)							
Flat Main	47.7600		47.7600	0.1100	5.2536	9.0000	429.8400 (30)							
Dormer Roofs	1.7500		1.7500	0.1100	0.1925	9.0000	15.7500 (30)							
Total net area of external elements Aum(A, m ²)			663.2500				(31)							
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	139.6868		(33)							
Internal Wall 1			531.8800			9.0000	4786.9200 (32c)							
Internal Floor 1			150.2700			18.0000	2704.8600 (32d)							
Internal Floor 2			61.9100			18.0000	1114.3800 (32d)							
Internal Ceiling 1			155.8300			9.0000	1402.4700 (32e)							
Internal Ceiling 2			61.9100			9.0000	557.1900 (32e)							
Heat capacity Cm = Sum(A x k)													(28)...(30) + (32) + (32a)...(32e) =	65977.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K														179.2806 (35)
List of Thermal Bridges														
K1 Element				Length	Psi-value	Total								
E2 Other lintels (including other steel lintels)				37.1200	0.0060	0.2227								
E3 Sill				36.1200	0.0190	0.6863								
E4 Jamb				77.2400	0.0060	0.4634								
E5 Ground floor (normal)				49.4400	0.0930	4.5979								
E6 Intermediate floor within a dwelling				104.1600	0.0000	0.0000								
E16 Corner (normal)				92.3900	0.0350	3.2337								
R1 Head of roof window				6.8600	0.1130	0.7752								
R2 Sill of roof window				6.8600	0.1180	0.8095								
R3 Jamb of roof window				13.7200	0.8800	12.0736								
E17 Corner (inverted - internal area greater than external area)				69.8000	0.0550	3.8390								
E11 Eaves (insulation at rafter level)				55.4600	0.0200	1.1092								
E13 Gable (insulation at rafter level)				15.6100	0.0670	1.0459								
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													28.8563 (36)	
Point Thermal bridges													(36a) =	0.0000
Total fabric heat loss													(33) + (36) + (36a) =	168.5432 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)														
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	166.6193	166.0508	165.4936	162.8763	162.3866	160.1070	160.1070	159.6849	160.9851	162.3866	163.3772	164.4129	(38)	
Heat transfer coeff	335.1625	334.5940	334.0368	331.4195	330.9298	328.6502	328.6502	328.2280	329.5282	330.9298	331.9204	332.9561	(39)	
Average = Sum(39)m / 12 =													331.4171	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9107	0.9092	0.9077	0.9006	0.8992	0.8930	0.8930	0.8919	0.8954	0.8992	0.9019	0.9047	(40)	
HLP (average)													0.9006	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31		

Full SAP Calculation Printout



4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.2203 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	33.7580	33.2567	32.5506	31.2489	30.2741	29.1933	28.6095	29.3106	30.0739	31.2304	32.5590	33.6439 (42b)
Hot water usage for other uses	47.6095	45.8783	44.1470	42.4158	40.6845	38.9533	38.9533	40.6845	42.4158	44.1470	45.8783	47.6095 (42c)
Average daily hot water use (litres/day)												74.5804 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	81.3675	79.1349	76.6977	73.6647	70.9587	68.1466	67.5628	69.9951	72.4897	75.3775	78.4373	81.2534 (44)
Distribution loss (46)m = 0.15 x (45)m	128.8663	112.6871	117.8815	100.8432	95.5240	83.7942	81.7113	86.6685	89.3870	102.2865	111.7483	127.2232 (45)
Water storage loss:												Total = Sum(45)m = 1238.6211
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 (46)
If cylinder contains dedicated solar storage												0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	109.5364	95.7840	100.1992	85.7167	81.1954	71.2250	69.4546	73.6683	75.9790	86.9435	94.9860	108.1397 (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	109.5364	95.7840	100.1992	85.7167	81.1954	71.2250	69.4546	73.6683	75.9790	86.9435	94.9860	108.1397 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 1052.8279 (64)
Electric shower(s)	62.6368	55.8099	60.9423	58.1564	59.2477	56.5166	58.4005	59.2477	58.1564	60.9423	59.7963	62.6368 (64a)
Heat gains from water heating, kWh/month	43.0433	37.8985	40.2854	35.9683	35.1108	31.9354	31.9638	33.2290	33.5339	36.9714	38.6956	42.6941 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 712.4896 (64a)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	270.1327	299.0755	270.1327	279.1371	270.1327	279.1371	270.1327	270.1327	279.1371	270.1327	279.1371	270.1327 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	511.2658	516.5712	503.2019	474.7403	438.8126	405.0456	382.4872	377.1819	390.5511	419.0128	454.9405	488.7074 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017 (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)	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137 (71)
Water heating gains (Table 5)	57.8539	56.3965	54.1470	49.9560	47.1919	44.3547	42.9621	44.6626	46.5748	49.6928	53.7439	57.3846 (72)
Total internal gains	910.5575	943.3483	898.7867	875.1385	827.4423	799.8426	766.8871	763.2823	787.5682	810.1434	859.1266	887.5298 (73)

6. Solar gains

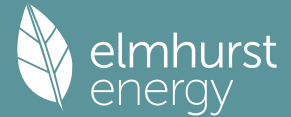
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.0900	10.6334	0.7600	0.7000	0.7700	12.1137 (74)						
East	19.7100	19.6403	0.7600	0.7000	0.7700	142.7180 (76)						
South	2.5400	46.7521	0.7600	0.7000	0.7700	43.7804 (78)						
West	26.5700	19.6403	0.7600	0.7000	0.7700	192.3905 (80)						
East	1.9200	26.0000	0.7600	0.7000	1.0000	23.9017 (82)						
West	2.8800	26.0000	0.7600	0.7000	1.0000	35.8525 (82)						
Solar gains	450.7568	874.4992	1430.8892	2085.6620	2563.5730	2629.6032	2501.1655	2141.9348	1662.6071	1034.4344	560.5213	371.7688 (83)
Total gains	1361.3143	1817.8475	2329.6759	2960.8005	3391.0153	3429.4458	3268.0526	2905.2171	2450.1753	1844.5778	1419.6479	1259.2986 (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	54.6808	54.7737	54.8651	55.2984	55.3802	55.7643	55.7643	55.8361	55.6157	55.3802	55.2149	55.0432
alpha	4.6454	4.6516	4.6577	4.6866	4.6920	4.7176	4.7176	4.7224	4.7077	4.6920	4.6810	4.6695
util living area	0.9989	0.9958	0.9826	0.9232	0.7821	0.5882	0.4372	0.5081	0.7926	0.9744	0.9972	0.9993 (86)
MIT	19.3156	19.5777	19.9838	20.4912	20.8304	20.9655	20.9931	20.9865	20.8677	20.3445	19.7260	19.2741 (87)
Th 2	20.1584	20.1597	20.1610	20.1670	20.1681	20.1734	20.1734	20.1744	20.1714	20.1681	20.1659	20.1635 (88)
util rest of house	0.9987	0.9947	0.9781	0.9047	0.7379	0.5208	0.3575	0.4220	0.7324	0.9653	0.9964	0.9991 (89)
MIT 2	18.5860	18.8484	19.2522	19.7464	20.0484	20.1552	20.1710	20.1693	20.0891	19.6157	19.0017	18.5484 (90)
Living area fraction												fLA = Living area / (4) = 0.1345 (91)
MIT	18.6841	18.9465	19.3506	19.8466	20.1536	20.2642	20.2816	20.2792	20.1938	19.7137	19.0991	18.6460 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6841	18.9465	19.3506	19.8466	20.1536	20.2642	20.2816	20.2792	20.1938	19.7137	19.0991	18.6460 (93)

8. Space heating requirement

Full SAP Calculation Printout



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9980	0.9926	0.9726	0.8964	0.7370	0.5285	0.3681	0.4332	0.7342	0.9588	0.9948	0.9986	(94)
Useful gains	1358.5661	1804.3488	2265.8305	2654.1671	2499.2283	1812.3883	1202.9020	1258.5853	1798.8952	1768.6228	1412.3212	1257.5170	(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	4821.0196	4699.8613	4292.5638	3627.9147	2797.5461	1861.5409	1209.9434	1273.2568	2008.0787	3016.0025	3982.7418	4809.8811	(97)
Space heating kWh	2576.0653	1945.7844	1507.8896	701.0983	221.9485	0.0000	0.0000	0.0000	0.0000	928.0505	1850.7029	2642.9589	(98a)
Space heating requirement - total per year (kWh/year)												12374.4985	
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	2576.0653	1945.7844	1507.8896	701.0983	221.9485	0.0000	0.0000	0.0000	0.0000	928.0505	1850.7029	2642.9589	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12374.4985	
Space heating per m2											(98c) / (4) =	33.6254	(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	3089.3117	2432.0113	2494.5331	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8978	0.9435	0.9109	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2773.5193	2294.7014	2272.3085	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	3790.4445	3611.4322	3205.4084	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	732.1862	979.6477	694.2264	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	183.0465	244.9119	173.5566	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												601.5151	(107)
Energy for space heating												33.6254	(99)
Energy for space cooling												1.6345	(108)
Total												35.2599	(109)
Fabric Energy Efficiency (DFEE)												35.3	(109)

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

1. Overall dwelling characteristics

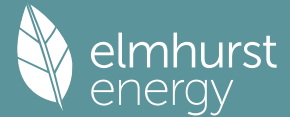
	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	155.8300 (1b)	x 2.3600 (2b)	= 367.7588 (1b)	- (3b)
First floor	150.2700 (1c)	x 2.8500 (2c)	= 428.2695 (1c)	- (3c)
Second floor	61.9100 (1d)	x 2.0200 (2d)	= 125.0582 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	368.0100		(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	921.0865 (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	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) =	0.0434 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.2934 (18)	
Number of sides sheltered	0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2934 (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	0.3741	0.3668	0.3594	0.3228	0.3154	0.2788	0.2788	0.2714	0.2934	0.3154	0.3301	0.3448	(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	0.5700	0.5673	0.5646	0.5521	0.5497	0.5389	0.5389	0.5368	0.5430	0.5497	0.5545	0.5594	(25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.0400	1.0000	2.0400			(26a)
TER Opening Type (Uw = 1.20)			51.9100	1.1450	59.4389			(27)
East Velux			1.9200	1.5918	3.0562			(27a)
West Velux			2.8800	1.5918	4.5843			(27a)
Heatloss Floor 1			155.8300	0.1300	20.2579			(28a)
External Wall 1	392.4600	53.9500	338.5100	0.1800	60.9318			(29a)
Dormer Cheeks	4.7100		4.7100	0.1800	0.8478			(29a)
Rafter	60.7400	4.8000	55.9400	0.1100	6.1534			(30)
Flat Main	47.7600		47.7600	0.1100	5.2536			(30)
Dormer Roofs	1.7500		1.7500	0.1100	0.1925			(30)
Total net area of external elements Aum(A, m2)			663.2500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	162.7564		(33)

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

179.2806 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	37.1200	0.0500	1.8560
E3 Sill	36.1200	0.0500	1.8060
E4 Jamb	77.2400	0.0500	3.8620
E5 Ground floor (normal)	49.4400	0.1600	7.9104
E6 Intermediate floor within a dwelling	104.1600	0.0000	0.0000
E16 Corner (normal)	92.3900	0.0900	8.3151
R1 Head of roof window	6.8600	0.0800	0.5488
R2 Sill of roof window	6.8600	0.0600	0.4116
R3 Jamb of roof window	13.7200	0.0800	1.0976
E17 Corner (inverted - internal area greater than external area)	69.8000	-0.0900	-6.2820
E11 Eaves (insulation at rafter level)	55.4600	0.0400	2.2184
E13 Gable (insulation at rafter level)	15.6100	0.0800	1.2488

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

22.9927 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 185.7491 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
173.2511	173.2511	172.4251	171.6154	167.8125	167.1010	163.7888	163.7888	163.1754	165.0646	167.1010	168.5404	170.0452 (38)
Heat transfer coeff	359.0002	358.1742	357.3645	353.5616	352.8501	349.5379	349.5379	348.9245	350.8137	352.8501	354.2895	355.7943 (39)
Average = Sum(39)m / 12 =												353.5582

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9755	0.9733	0.9711	0.9607	0.9588	0.9498	0.9498	0.9481	0.9533	0.9588	0.9627	0.9668 (40)
HLP (average)												0.9607
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

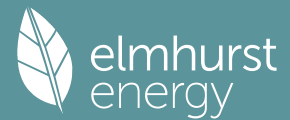
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.2203 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	33.7580	33.2567	32.5506	31.2489	30.2741	29.1933	28.6095	29.3106	30.0739	31.2304	32.5590	33.6439 (42b)	
Hot water usage for other uses	47.6095	45.8783	44.1470	42.4158	40.6845	38.9533	38.9533	40.6845	42.4158	44.1470	45.8783	47.6095 (42c)	
Average daily hot water use (litres/day)													74.5804 (43)
Daily hot water use	81.3675	79.1349	76.6977	73.6647	70.9587	68.1466	67.5628	69.9951	72.4897	75.3775	78.4373	81.2534 (44)	
Energy conte	128.8663	112.6871	117.8815	100.8432	95.5240	83.7942	81.7113	86.6685	89.3870	102.2865	111.7483	127.2232 (45)	
Energy content (annual)													Total = Sum(45)m = 1238.6211
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	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	109.5364	95.7840	100.1992	85.7167	81.1954	71.2250	69.4546	73.6683	75.9790	86.9435	94.9860	108.1397 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
FV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
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	109.5364	95.7840	100.1992	85.7167	81.1954	71.2250	69.4546	73.6683	75.9790	86.9435	94.9860	108.1397 (64)	
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 1052.8279 (64)
Electric shower(s)	62.6368	55.8099	60.9423	58.1564	59.2477	56.5166	58.4005	59.2477	58.1564	60.9423	59.7963	62.6368 (64a)	
Heat gains from water heating, kWh/month	43.0433	37.8985	40.2854	35.9683	35.1108	31.9354	31.9638	33.2290	33.5339	36.9714	38.6956	42.6941 (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	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171	161.0171 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	270.1327	299.0755	270.1327	279.1371	270.1327	279.1371	270.1327	270.1327	279.1371	270.1327	279.1371	270.1327 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	511.2658	516.5712	503.2019	474.7403	438.8126	405.0456	382.4872	377.1819	390.5511	419.0128	454.9405	488.7074 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017	39.1017 (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)	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137 (71)
Water heating gains (Table 5)												

Full SAP Calculation Printout



Total internal gains	57.8539	56.3965	54.1470	49.9560	47.1919	44.3547	42.9621	44.6626	46.5748	49.6928	53.7439	57.3846 (72)
	910.5575	943.3483	898.7867	875.1385	827.4423	799.8426	766.8871	763.2823	787.5682	810.1434	859.1266	887.5298 (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	3.0900	10.6334	0.6300	0.7000	0.7700	10.0416 (74)						
East	19.7100	19.6403	0.6300	0.7000	0.7700	118.3057 (76)						
South	2.5400	46.7521	0.6300	0.7000	0.7700	36.2916 (78)						
West	26.5700	19.6403	0.6300	0.7000	0.7700	159.4816 (80)						
East	1.9200	26.0000	0.6300	0.7000	1.0000	19.8132 (82)						
West	2.8800	26.0000	0.6300	0.7000	1.0000	29.7199 (82)						
Solar gains	373.6537	724.9138	1186.1319	1728.9040	2125.0671	2179.8027	2073.3346	1775.5512	1378.2138	857.4917	464.6427	308.1768 (83)
Total gains	1284.2112	1668.2621	2084.9186	2604.0425	2952.5094	2979.6452	2840.2216	2538.8335	2165.7820	1667.6351	1323.7692	1195.7066 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.0500	51.1677	51.2837	51.8353	51.9398	52.4320	52.4320	52.5241	52.2413	51.9398	51.7288	51.5100	
alpha	4.4033	4.4112	4.4189	4.4557	4.4627	4.4955	4.4955	4.5016	4.4828	4.4627	4.4486	4.4340	
util living area	0.9991	0.9970	0.9892	0.9541	0.8573	0.6857	0.5252	0.6001	0.8600	0.9836	0.9979	0.9994 (86)	
MIT	19.1566	19.3939	19.7784	20.2958	20.7053	20.9237	20.9818	20.9679	20.7805	20.2029	19.5858	19.1251 (87)	
Th 2	20.1038	20.1057	20.1075	20.1162	20.1178	20.1254	20.1254	20.1268	20.1225	20.1178	20.1145	20.1111 (88)	
util rest of house	0.9989	0.9962	0.9863	0.9414	0.8194	0.6124	0.4280	0.4996	0.8073	0.9774	0.9972	0.9992 (89)	
MIT 2	18.3861	18.6244	19.0084	19.5217	19.9014	20.0834	20.1189	20.1142	19.9792	19.4388	18.8231	18.3601 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	18.4897	18.7279	19.1120	19.6258	20.0095	20.1964	20.2349	20.2290	20.0869	19.5416	18.9257	18.4630 (92)	
Temperature adjustment	0.0000												
adjusted MIT	18.4897	18.7279	19.1120	19.6258	20.0095	20.1964	20.2349	20.2290	20.0869	19.5416	18.9257	18.4630 (93)	

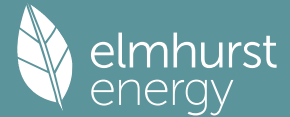
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9945	0.9819	0.9326	0.8141	0.6188	0.4406	0.5120	0.8048	0.9717	0.9959	0.9987 (94)
Useful gains	1281.9846	1659.1330	2047.1931	2428.6267	2403.5777	1843.6970	1251.4348	1299.7893	1743.1074	1620.4995	1318.3770	1194.2017 (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	5094.1060	4952.7959	4507.0693	3792.2219	2931.9969	1956.1588	1270.5399	1336.0243	2100.2992	3155.0403	4189.7089	5074.6892 (97)
Space heating kWh	2836.2183	2213.3415	1830.1479	981.7885	393.1439	0.0000	0.0000	0.0000	0.0000	1141.6984	2067.3590	2887.0827 (98a)
Space heating requirement - total per year (kWh/year)	14350.7802											
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	2836.2183	2213.3415	1830.1479	981.7885	393.1439	0.0000	0.0000	0.0000	0.0000	1141.6984	2067.3590	2887.0827 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	14350.7802											
Space heating per m2	(98c) / (4) = 38.9956 (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	3285.6559	2586.5801	2651.8261	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8171	0.8860	0.8380	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2684.6225	2291.5853	2222.3584	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	3277.9778	3123.9142	2787.5881	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	427.2158	619.2527	420.5309	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	106.8040	154.8132	105.1327	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	366.7498 (107)											
Energy for space heating	38.9956 (99)											
Energy for space cooling	0.9966 (108)											
Total	39.9922 (109)											
Fabric Energy Efficiency (TFEE)	40.0 (109)											

Full SAP Calculation Printout



1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	155.8300 (1b)	x 2.3600 (2b)	= 367.7588 (1b) - (3b)
First floor	150.2700 (1c)	x 2.8500 (2c)	= 428.2695 (1c) - (3c)
Second floor	61.9100 (1d)	x 2.0200 (2d)	= 125.0582 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	368.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	921.0865 (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) =	0.0869 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate		0.2869 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2869 (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	0.3657	0.3586	0.3514	0.3155	0.3084	0.2725	0.2725	0.2653	0.2869	0.3084	0.3227	0.3371 (22b)
Effective ac	0.5669	0.5643	0.5617	0.5498	0.5475	0.5371	0.5371	0.5352	0.5411	0.5475	0.5521	0.5568 (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
Front Door			2.0400	1.2000	2.4480		(26a)
Windows (Uw = 1.00)			51.9100	0.9615	49.9135		(27)
East Velux			1.9200	1.1450	2.1985		(27a)
West Velux			2.8800	1.1450	3.2977		(27a)
Heatloss Floor 1			155.8300	0.1200	18.6996	110.0000	17141.3000 (28a)
External Wall 1	392.4600	53.9500	338.5100	0.1500	50.7765	110.0000	37236.1000 (29a)
Dormer Cheeks	4.7100		4.7100	0.1600	0.7536	18.0000	84.7800 (29a)
Rafter	60.7400	4.8000	55.9400	0.1100	6.1534	9.0000	503.4600 (30)
Flat Main	47.7600		47.7600	0.1100	5.2536	9.0000	429.8400 (30)
Dormer Roofs	1.7500		1.7500	0.1100	0.1925	9.0000	15.7500 (30)
Total net area of external elements Aum(A, m ²)			663.2500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	139.6868	(33)
Internal Wall 1			531.8800			9.0000	4786.9200 (32c)
Internal Floor 1			150.2700			18.0000	2704.8600 (32d)
Internal Floor 2			61.9100			18.0000	1114.3800 (32d)
Internal Ceiling 1			155.8300			9.0000	1402.4700 (32e)
Internal Ceiling 2			61.9100			9.0000	557.1900 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	65977.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		179.2806 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	37.1200	0.0060	0.2227
E2 Other lintels (including other steel lintels)	36.1200	0.0190	0.6863
E3 Sill	77.2400	0.0060	0.4634
E4 Jamb	49.4400	0.0930	4.5979
E5 Ground floor (normal)	104.1600	0.0000	0.0000
E6 Intermediate floor within a dwelling	92.3900	0.0350	3.2337
E16 Corner (normal)	6.8600	0.1130	0.7752
R1 Head of roof window	6.8600	0.1180	0.8095
R2 Sill of roof window	13.7200	0.8800	12.0736
R3 Jamb of roof window	69.8000	0.0550	3.8390
E17 Corner (inverted - internal area greater than external area)	55.4600	0.0200	1.1092
E11 Eaves (insulation at rafter level)	15.6100	0.0670	1.0459
E13 Gable (insulation at rafter level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		28.8563 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	168.5432 (37)

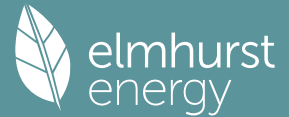
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	172.3088	171.5193	170.7456	167.1111	166.4311	163.2656	163.2656	162.6794	164.4849	166.4311	167.8067	169.2449 (38)
Heat transfer coeff	340.8519	340.0625	339.2887	335.6543	334.9743	331.8088	331.8088	331.2226	333.0281	334.9743	336.3499	337.7881 (39)
Average = Sum(39)m / 12 =												335.6510

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9262	0.9241	0.9220	0.9121	0.9102	0.9016	0.9016	0.9000	0.9049	0.9102	0.9140	0.9179 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.2203 (42)
-------------------	-------------

Full SAP Calculation Printout



Hot water usage for mixer showers	85.1979	83.9176	82.0518	78.4821	75.8477	72.9099	71.2400	73.0916	75.1213	78.2757	81.9221	84.8715 (42a)
Hot water usage for baths	33.7580	33.2567	32.5506	31.2489	30.2741	29.1933	28.6095	29.3106	30.0739	31.2304	32.5590	33.6439 (42b)
Hot water usage for other uses	47.6095	45.8783	44.1470	42.4158	40.6845	38.9533	38.9533	40.6845	42.4158	44.1470	45.8783	47.6095 (42c)
Average daily hot water use (litres/day)												153.1300 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	166.5655	163.0525	158.7495	152.1467	146.8064	141.0564	138.8028	143.0867	147.6110	153.6531	160.3594	166.1249 (44)
Energy content (annual)	263.7990	232.1846	243.9921	208.2813	197.6296	173.4453	167.8699	177.1712	182.0191	208.5059	228.4613	260.1115 (45)
Distribution loss (46)m = 0.15 x (45)m	39.5698	34.8277	36.5988	31.2422	29.6444	26.0168	25.1805	26.5757	27.3029	31.2759	34.2692	39.0167 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9720 (55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (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	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059 (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	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	130.4287	115.7831	123.8429	110.5911	108.4274	99.0082	98.5323	101.6249	101.8590	112.0437	117.3010	129.2026 (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	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.1437	67.6301	55.0005	41.6389	31.1256	26.2775	28.3938	36.9073	49.5370	62.8986	73.4119	78.2600 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	763.0833	771.0017	751.0476	708.5675	654.9441	604.5457	570.8764	562.9580	582.9122	625.3922	679.0156	729.4141 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424 (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)	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137 (71)
Water heating gains (Table 5)	175.3074	172.2963	166.4555	153.5988	145.7357	137.5114	132.4358	136.5927	141.4708	150.5964	162.9180	173.6594 (72)
Total internal gains	1136.4836	1132.8775	1094.4529	1025.7545	953.7547	890.2838	853.6553	858.4073	895.8692	960.8364	1037.2948	1103.2827 (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	3.0900	10.6334	0.7600	0.7000	0.7700	12.1137 (74)						
East	19.7100	19.6403	0.7600	0.7000	0.7700	142.7180 (76)						
South	2.5400	46.7521	0.7600	0.7000	0.7700	43.7804 (78)						
West	26.5700	19.6403	0.7600	0.7000	0.7700	192.3905 (80)						
East	1.9200	26.0000	0.7600	0.7000	1.0000	23.9017 (82)						
West	2.8800	26.0000	0.7600	0.7000	1.0000	35.8525 (82)						
Solar gains	450.7568	874.4992	1430.8892	2085.6620	2563.5730	2629.6032	2501.1655	2141.9348	1662.6071	1034.4344	560.5213	371.7688 (83)
Total gains	1587.2405	2007.3766	2525.3421	3111.4166	3517.3277	3519.8871	3354.8208	3000.3421	2558.4763	1995.2708	1597.8161	1475.0515 (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	53.7681	53.8929	54.0158	54.6007	54.7115	55.2335	55.2335	55.3312	55.0313	54.7115	54.4878	54.2558
alpha	4.5845	4.5929	4.6011	4.6400	4.6474	4.6822	4.6822	4.6887	4.6688	4.6474	4.6325	4.6171
util living area	0.9979	0.9937	0.9768	0.9126	0.7696	0.5795	0.4301	0.4972	0.7767	0.9665	0.9954	0.9985 (86)
Living	19.7124	19.8985	20.2035	20.5692	20.8117	20.9089	20.9288	20.9244	20.8409	20.4697	20.0143	19.6825
Non living	18.6038	18.8430	19.2315	19.6884	19.9639	20.0644	20.0791	20.0782	20.0051	19.5774	18.9985	18.5709
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	3	0	0	0	0	0	0	0	0	0	31
16 / 9	0	25	31	2	0	0	0	0	0	0	0	30
MIT	21.0000	20.4430	20.5489	20.5816	20.8117	20.9089	20.9288	20.9244	20.8409	20.4697	20.4417	21.0000 (87)
Th 2	20.1453	20.1471	20.1489	20.1572	20.1588	20.1661	20.1661	20.1675	20.1633	20.1588	20.1556	20.1523 (88)
util rest of house	0.9974	0.9921	0.9711	0.8923	0.7242	0.5122	0.3510	0.4119	0.7146	0.9551	0.9941	0.9982 (89)
MIT 2	20.1453	19.6332	19.7440	19.7059	19.9639	20.0644	20.0791	20.0782	20.0051	19.5774	19.6449	20.1523 (90)
Living area fraction										FLA = Living area / (4) =		0.1345 (91)
MIT	20.2602	19.7421	19.8522	19.8236	20.0779	20.1780	20.1933	20.1920	20.1175	19.6974	19.7521	20.2663 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2602	19.7421	19.8522	19.8236	20.0779	20.1780	20.1933	20.1920	20.1175	19.6974	19.7521	20.2663 (93)

Full SAP Calculation Printout



8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9975	0.9912	0.9687	0.8829	0.7195	0.5132	0.3536	0.4145	0.7109	0.9469	0.9933	0.9982	(94)
Useful gains	1583.2712	1989.7633	2446.4005	2747.2198	2530.7721	1806.4047	1186.2313	1243.5908	1818.7824	1889.3415	1587.1001	1472.4259	(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	5440.0743	5047.2363	4530.2553	3666.5665	2806.3892	1850.8281	1192.3022	1255.9875	2004.0070	3047.3882	4255.5245	5427.0129	(97)
Space heating kWh	2869.4615	2054.6219	1550.3880	661.9296	205.0591	0.0000	0.0000	0.0000	0.0000	861.5867	1921.2656	2942.2128	(98a)
Space heating requirement - total per year (kWh/year)												13066.5252	
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	2869.4615	2054.6219	1550.3880	661.9296	205.0591	0.0000	0.0000	0.0000	0.0000	861.5867	1921.2656	2942.2128	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13066.5252	
Space heating per m2										(98c) / (4) =		35.5059	(99)

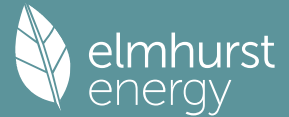
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													345.1228	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													65.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	2869.4615	2054.6219	1550.3880	661.9296	205.0591	0.0000	0.0000	0.0000	0.0000	861.5867	1921.2656	2942.2128	(98)	
Space heating efficiency (main heating system 1)	345.1228	345.1228	345.1228	345.1228	345.1228	0.0000	0.0000	0.0000	0.0000	345.1228	345.1228	345.1228	(210)	
Space heating fuel (main heating system)	831.4321	595.3307	449.2279	191.7954	59.4163	0.0000	0.0000	0.0000	0.0000	249.6464	556.6905	852.5119	(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	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	(64)	
Efficiency of water heater (217)m	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	169.7336	(216)	
Fuel for water heating, kWh/month	186.8772	165.2070	175.2078	153.1537	147.8929	132.6298	130.3598	135.8397	137.6811	154.3008	165.0430	184.7047	(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	66.6481	53.4676	48.1416	35.2706	27.2441	22.2586	24.8529	32.3048	41.9607	55.0547	62.1842	68.5005	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-91.9888	-136.1131	-201.2406	-222.0897	-231.2039	-208.5777	-205.5558	-192.7937	-169.3611	-151.2632	-102.1876	-78.7666	(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	-28.2188	-64.4788	-140.3905	-235.7632	-334.4348	-347.5352	-343.2078	-286.6639	-206.1503	-105.1669	-40.3959	-21.8266	(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													3786.0512	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													169.7336	
Water heating fuel used													1868.8977	(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)													537.8885	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-4145.3745	(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													2047.4629	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3786.0512	16.4900	624.3198	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1868.8977	16.4900	308.1812	(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	537.8885	16.4900	88.6978	(250)
Additional standing charges			0.0000	(251)

Full SAP Calculation Printout



Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1991.1419	16.4900	-328.3393
PV Unit electricity exported	-2154.2327	5.5900	-120.4216
Total			-448.7609 (252)
Total energy cost			572.4380 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4990 (257)
SAP value		91.9118
SAP rating (Section 12)		92 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3786.0512	0.1563	591.7495 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1868.8977	0.1410	263.5337 (264)
Space and water heating			855.2832 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	537.8885	0.1443	77.6339 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1991.1419	0.1350	-268.7819
PV Unit electricity exported	-2154.2327	0.1230	-264.9540
Total			-533.7358 (269)
Total CO2, kg/year			399.1813 (272)
CO2 emissions per m2			1.0800 (273)
EI value			98.7049
EI rating			99 (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)
Ground floor	155.8300 (1b)	x 2.3600 (2b)	= 367.7588 (1b) - (3b)
First floor	150.2700 (1c)	x 2.8500 (2c)	= 428.2695 (1c) - (3c)
Second floor	61.9100 (1d)	x 2.0200 (2d)	= 125.0582 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	368.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	921.0865 (5)

2. Ventilation rate

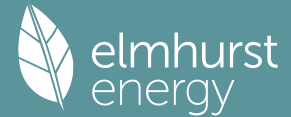
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked 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) =	80.0000 / (5) =	0.0869 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2869 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2869 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.7000	3.6000	3.4000	3.4000	3.2000	3.2000	3.4000	3.4000	3.7000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9250	0.9000	0.8500	0.8500	0.8000	0.8000	0.8500	0.8500	0.9250 (22a)
Adj infiltr rate	0.3084	0.2940	0.2940	0.2653	0.2582	0.2438	0.2438	0.2295	0.2295	0.2438	0.2438	0.2653 (22b)
Effective ac	0.5475	0.5432	0.5432	0.5352	0.5333	0.5297	0.5297	0.5263	0.5263	0.5297	0.5297	0.5352 (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
---------	----------	-------------	------------	---------------	-----------	----------------	------------

Full SAP Calculation Printout



Front Door				2.0400	1.2000	2.4480							(26a)
Windows (Uw = 1.00)				51.9100	0.9615	49.9135							(27)
East Velux				1.9200	1.1450	2.1985							(27a)
West Velux				2.8800	1.1450	3.2977							(27a)
Heatloss Floor 1				155.8300	0.1200	18.6996	110.0000	17141.3000					(28a)
External Wall 1	392.4600		53.9500	338.5100	0.1500	50.7765	110.0000	37236.1000					(29a)
Dormer Cheeks	4.7100			4.7100	0.1600	0.7536	18.0000	84.7800					(29a)
Rafter	60.7400		4.8000	55.9400	0.1100	6.1534	9.0000	503.4600					(30)
Flat Main	47.7600			47.7600	0.1100	5.2536	9.0000	429.8400					(30)
Dormer Roofs	1.7500			1.7500	0.1100	0.1925	9.0000	15.7500					(30)
Total net area of external elements Aum(A, m2)				663.2500									(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		139.6868							(33)
Internal Wall 1				531.8800			9.0000	4786.9200					(32c)
Internal Floor 1				150.2700			18.0000	2704.8600					(32d)
Internal Floor 2				61.9100			18.0000	1114.3800					(32d)
Internal Ceiling 1				155.8300			9.0000	1402.4700					(32e)
Internal Ceiling 2				61.9100			9.0000	557.1900					(32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	65977.0500					(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								179.2806					(35)

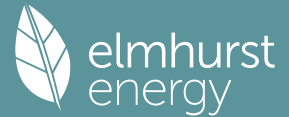
List of Thermal Bridges				Length	Psi-value	Total		
K1 Element				37.1200	0.0060	0.2227		
E2 Other lintels (including other steel lintels)				36.1200	0.0190	0.6863		
E3 Sill				77.2400	0.0060	0.4634		
E4 Jamb				49.4400	0.0930	4.5979		
E5 Ground floor (normal)				104.1600	0.0000	0.0000		
E6 Intermediate floor within a dwelling				92.3900	0.0350	3.2337		
E16 Corner (normal)				6.8600	0.1130	0.7752		
R1 Head of roof window				6.8600	0.1180	0.8095		
R2 Sill of roof window				13.7200	0.8800	12.0736		
R3 Jamb of roof window				69.8000	0.0550	3.8390		
E17 Corner (inverted - internal area greater than external area)				55.4600	0.0200	1.1092		
E11 Eaves (insulation at rafter level)				15.6100	0.0670	1.0459		
E13 Gable (insulation at rafter level)								
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							28.8563	(36)
Point Thermal bridges							0.0000	(36a)
Total fabric heat loss							168.5432	(33) + (36) + (36a) = (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	166.4311	165.1180	165.1180	162.6794	162.1088	161.0146	161.0146	159.9829	159.9829	161.0146	161.0146	162.6794	(38)
Average = Sum(39)m / 12 =	334.9743	333.6612	333.6612	331.2226	330.6520	329.5578	329.5578	328.5261	328.5261	329.5578	329.5578	331.2226	(39)
													330.8898
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9102	0.9067	0.9067	0.9000	0.8985	0.8955	0.8955	0.8927	0.8927	0.8955	0.8955	0.9000	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
													0.8991
													31

4. Water heating energy requirements (kWh/year)														
Assumed occupancy													3.2203	(42)
Hot water usage for mixer showers	85.1979	83.9176	82.0518	78.4821	75.8477	72.9099	71.2400	73.0916	75.1213	78.2757	81.9221	84.8715	84.8715	(42a)
Hot water usage for baths	33.7580	33.2567	32.5506	31.2489	30.2741	29.1933	28.6095	29.3106	30.0739	31.2304	32.5590	33.6439	33.6439	(42b)
Hot water usage for other uses	47.6095	45.8783	44.1470	42.4158	40.6845	38.9533	38.9533	40.6845	42.4158	44.1470	45.8783	47.6095	47.6095	(42c)
Average daily hot water use (litres/day)													153.1300	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	166.5655	163.0525	158.7495	152.1467	146.8064	141.0564	138.8028	143.0867	147.6110	153.6531	160.3594	166.1249	(44)	
Energy content (annual)	263.7990	232.1846	243.9921	208.2813	197.6296	173.4453	167.8699	177.1712	182.0191	208.5059	228.4613	260.1115	(45)	
Distribution loss (46)m = 0.15 x (45)m	39.5698	34.8277	36.5988	31.2422	29.6444	26.0168	25.1805	26.5757	27.3029	31.2759	34.2692	39.0167	(46)	
Water storage loss:														
Store volume													300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8000	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	(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	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	313.5059	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	313.5059	(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)
Heat gains from water heating, kWh/month	130.4287	115.7831	123.8429	110.5911	108.4274	99.0082	98.5323	101.6249	101.8590	112.0437	117.3010	129.2026	129.2026	(65)

5. Internal gains (see Table 5 and 5a)														
Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	76.1437	67.6301	55.0005	41.6389	31.1256	26.2775	28.3938	36.9073	49.5370	62.8986	73.4119	78.2600	78.2600	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	763.0833	771.0017	751.0476	708.5675	654.9441	604.5457	570.8764	562.9580	582.9122	625.3922	679.0156	729.4141	729.4141	(68)
	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	(69)

Full SAP Calculation Printout



Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137 (71)
Water heating gains (Table 5)	175.3074	172.2963	166.4555	153.5988	145.7357	137.5114	132.4358	136.5927	141.4708	150.5964	162.9180	173.6594	173.6594 (72)
Total internal gains	1136.4836	1132.8775	1094.4529	1025.7545	953.7547	890.2838	853.6553	858.4073	895.8692	960.8364	1037.2948	1103.2827	1103.2827 (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	3.0900	12.3370	0.7600	0.7000	0.7700	14.0545 (74)							
East	19.7100	23.0226	0.7600	0.7000	0.7700	167.2959 (76)							
South	2.5400	52.2144	0.7600	0.7000	0.7700	48.8955 (78)							
West	26.5700	23.0226	0.7600	0.7000	0.7700	225.5227 (80)							
East	1.9200	31.0000	0.7600	0.7000	1.0000	28.4982 (82)							
West	2.8800	31.0000	0.7600	0.7000	1.0000	42.7473 (82)							
Solar gains	527.0140	874.9782	1454.1258	2172.9057	2582.4046	2846.4771	2679.5632	2323.8146	1812.0426	1156.0233	649.8886	416.4581	416.4581 (83)
Total gains	1663.4976	2007.8557	2548.5786	3198.6602	3536.1593	3736.7610	3533.2185	3182.2219	2707.9117	2116.8597	1687.1834	1519.7408	1519.7408 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	54.7115	54.9268	54.9268	55.3312	55.4267	55.6108	55.6108	55.7854	55.7854	55.6108	55.6108	55.3312	55.3312
tau	4.6474	4.6618	4.6618	4.6887	4.6951	4.7074	4.7074	4.7190	4.7190	4.7074	4.7074	4.6887	4.6887
util living area	0.9973	0.9933	0.9742	0.8982	0.7467	0.5241	0.3799	0.4288	0.7377	0.9548	0.9939	0.9982	0.9982 (86)
Living	19.7901	19.9456	20.2507	20.6146	20.8338	20.9188	20.9315	20.9298	20.8636	20.5331	20.0849	19.7538	19.7538
Non living	18.7136	18.9146	19.3012	19.7506	19.9961	20.0771	20.0859	20.0876	20.0355	19.6650	19.1008	18.6739	18.6739
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	0	0	0	0	0	0	0	0	0	0	30	30
16 / 9	0	28	31	0	0	0	0	0	0	0	0	30	30
MIT	21.0000	20.4028	20.5756	20.6146	20.8338	20.9188	20.9315	20.9298	20.8636	20.5331	20.4817	20.9772	20.9772 (87)
Th 2	20.1588	20.1618	20.1618	20.1675	20.1688	20.1713	20.1713	20.1737	20.1737	20.1713	20.1713	20.1675	20.1675 (88)
util rest of house	0.9966	0.9916	0.9679	0.8753	0.6989	0.4580	0.3043	0.3467	0.6728	0.9399	0.9921	0.9978	0.9978 (89)
MIT 2	20.1588	19.6113	19.7820	19.7506	19.9961	20.0771	20.0859	20.0876	20.0355	19.6650	19.6988	20.1462	20.1462 (90)
Living area fraction	20.2719	19.7178	19.8887	19.8668	20.1088	20.1903	20.1996	20.2009	20.1469	19.7818	19.8041	20.2580	20.2580 (91)
MIT	20.2719	19.7178	19.8887	19.8668	20.1088	20.1903	20.1996	20.2009	20.1469	19.7818	19.8041	20.2580	20.2580 (92)
Temperature adjustment	20.2719	19.7178	19.8887	19.8668	20.1088	20.1903	20.1996	20.2009	20.1469	19.7818	19.8041	20.2580	20.2580 (93)
adjusted MIT	20.2719	19.7178	19.8887	19.8668	20.1088	20.1903	20.1996	20.2009	20.1469	19.7818	19.8041	20.2580	20.2580 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9905	0.9654	0.8659	0.6952	0.4596	0.3069	0.3495	0.6706	0.9310	0.9911	0.9978	0.9978 (94)
Useful gains	1658.0452	1988.8750	2460.5187	2769.6068	2458.3627	1717.4259	1084.4691	1112.0746	1815.7966	1970.8955	1672.2048	1516.4277	1516.4277 (95)
Ext temp.	4.6000	5.1000	6.7000	9.1000	12.0000	14.9000	16.9000	16.8000	14.2000	10.8000	7.3000	4.5000	4.5000 (96)
Heat loss rate W	5249.6953	4877.3841	4400.5593	3566.2167	2681.1817	1743.4630	1087.4070	1117.2783	1953.7115	2960.0070	4120.8268	5219.3923	5219.3923 (97)
Space heating kWh	2672.1877	1941.0781	1443.3902	573.5591	165.7774	0.0000	0.0000	0.0000	0.0000	735.8989	1763.0079	2755.0057	2755.0057 (98a)
Space heating requirement - total per year (kWh/year)													12049.9050
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	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)													0.0000
Space heating kWh	2672.1877	1941.0781	1443.3902	573.5591	165.7774	0.0000	0.0000	0.0000	0.0000	735.8989	1763.0079	2755.0057	2755.0057 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)													12049.9050
Space heating per m2										(98c) / (4) =			32.7434 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													345.0076 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
Space heating requirement	2672.1877	1941.0781	1443.3902	573.5591	165.7774	0.0000	0.0000	0.0000	0.0000	735.8989	1763.0079	2755.0057	2755.0057 (98)
Space heating efficiency (main heating system 1)	345.0076	345.0076	345.0076	345.0076	345.0076	0.0000	0.0000	0.0000	0.0000	345.0076	345.0076	345.0076	345.0076 (210)
Space heating fuel (main heating system)	774.5300	562.6189	418.3647	166.2453	48.0503	0.0000	0.0000	0.0000	0.0000	213.2993	511.0055	798.5347	798.5347 (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	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	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	0.0000 (215)
Water heating requirement	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	313.5059 (64)
Efficiency of water heater (217)m	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297 (216)
Fuel for water heating, kWh/month	186.8814	165.2108	175.2118	153.1572	147.8963	132.6328	130.3627	135.8428	137.6843	154.3043	165.0467	184.7089	184.7089 (219)

Full SAP Calculation Printout



Current energy efficiency rating: A 92
 Current environmental impact rating: A 99

N Solar water heating SAP increase too small
 U Solar photovoltaic panels Already installed
 V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
 (none)

Measures omitted - SAP change or cost saving too small:
 N Solar water heating + 0.7 -£ 81 -45 kg (13.8%)

Recommended measures Typical annual savings Energy Environmental efficiency impact
 (none) Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: A 92
 Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 536 TEST (31 Jan 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £1484	Potential £1484	Saving £0
Electricity			
Space heating	£879	£879	£0
Water heating	£470	£470	£0
Lighting	£135	£135	£0
Generated (PV)	-£653	-£653	£0
Total cost of fuels	£831	£831	£0
Total cost of uses	£831	£831	£0
Delivered energy	4 kWh/m ²	4 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m ²	1 kg/m ²	1 kg/m ²	0 kg/m ²
Primary energy	14 kWh/m ²	14 kWh/m ²	0 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

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	155.8300 (1b)	x 2.3600 (2b)	= 367.7588 (1b) - (3b)
First floor	150.2700 (1c)	x 2.8500 (2c)	= 428.2695 (1c) - (3c)
Second floor	61.9100 (1d)	x 2.0200 (2d)	= 125.0582 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	368.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	921.0865 (5)

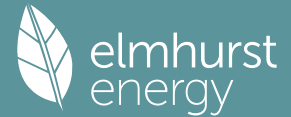
2. Ventilation rate

	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)

Air changes per hour
 Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 80.0000 / (5) = 0.0869 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 4.0000 (17)
 Infiltration rate 0.2869 (18)
 Number of sides sheltered 0 (19)
 Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2869 (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	0.3657	0.3586	0.3514	0.3155	0.3084	0.2725	0.2725	0.2653	0.2869	0.3084	0.3227	0.3371 (22b)
Effective ac	0.5669	0.5643	0.5617	0.5498	0.5475	0.5371	0.5371	0.5352	0.5411	0.5475	0.5521	0.5568 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Front Door			2.0400	1.2000	2.4480			(26a)
Windows (Uw = 1.00)			51.9100	0.9615	49.9135			(27)
East Velux			1.9200	1.1450	2.1985			(27a)
West Velux			2.8800	1.1450	3.2977			(27a)
Heatloss Floor 1			155.8300	0.1200	18.6996	110.0000	17141.3000	(28a)
External Wall 1	392.4600	53.9500	338.5100	0.1500	50.7765	110.0000	37236.1000	(29a)
Dormer Cheeks	4.7100		4.7100	0.1600	0.7536	18.0000	84.7800	(29a)
Rafter	60.7400	4.8000	55.9400	0.1100	6.1534	9.0000	503.4600	(30)
Flat Main	47.7600		47.7600	0.1100	5.2536	9.0000	429.8400	(30)
Dormer Roofs	1.7500		1.7500	0.1100	0.1925	9.0000	15.7500	(30)
Total net area of external elements Aum(A, m2)			663.2500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	139.6868		(33)
Internal Wall 1			531.8800			9.0000	4786.9200	(32c)
Internal Floor 1			150.2700			18.0000	2704.8600	(32d)
Internal Floor 2			61.9100			18.0000	1114.3800	(32d)
Internal Ceiling 1			155.8300			9.0000	1402.4700	(32e)
Internal Ceiling 2			61.9100			9.0000	557.1900	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 65977.0500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.2806 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	37.1200	0.0060	0.2227
E3 Sill	36.1200	0.0190	0.6863
E4 Jamb	77.2400	0.0060	0.4634
E5 Ground floor (normal)	49.4400	0.0930	4.5979
E6 Intermediate floor within a dwelling	104.1600	0.0000	0.0000
E16 Corner (normal)	92.3900	0.0350	3.2337
R1 Head of roof window	6.8600	0.1130	0.7752
R2 Sill of roof window	6.8600	0.1180	0.8095
R3 Jamb of roof window	13.7200	0.8800	12.0736
E17 Corner (inverted - internal area greater than external area)	69.8000	0.0550	3.8390
E11 Eaves (insulation at rafter level)	55.4600	0.0200	1.1092
E13 Gable (insulation at rafter level)	15.6100	0.0670	1.0459

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 28.8563 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 168.5432 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	172.3088	171.5193	170.7456	167.1111	166.4311	163.2656	163.2656	162.6794	164.4849	166.4311	167.8067	169.2449 (38)
Average = Sum(39)m / 12 =	340.8519	340.0625	339.2887	335.6543	334.9743	331.8088	331.8088	331.2226	333.0281	334.9743	336.3499	337.7881 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9262	0.9241	0.9220	0.9121	0.9102	0.9016	0.9016	0.9000	0.9049	0.9102	0.9140	0.9179 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

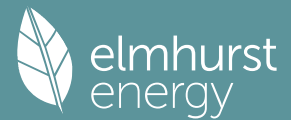
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.2203 (42)	
Hot water usage for mixer showers														84.8715 (42a)
Hot water usage for baths														33.6439 (42b)
Hot water usage for other uses														47.6095 (42c)
Average daily hot water use (litres/day)														153.1300 (43)
Daily hot water use	166.5655	163.0525	158.7495	152.1467	146.8064	141.0564	138.8028	143.0867	147.6110	153.6531	160.3594	166.1249	166.1249 (44)	
Energy content (annual)	263.7990	232.1846	243.9921	208.2813	197.6296	173.4453	167.8699	177.1712	182.0191	208.5059	228.4613	260.1115	260.1115 (45)	
Distribution loss (46)m = 0.15 x (45)m	39.5698	34.8277	36.5988	31.2422	29.6444	26.0168	25.1805	26.5757	27.3029	31.2759	34.2692	39.0167	39.0167 (46)	
Water storage loss:														
Store volume													300.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):													1.8000 (48)	
Temperature factor from Table 2b													0.5400 (49)	
Enter (49) or (54) in (55)													0.9720 (55)	
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320 (56)	
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320 (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	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	313.5059 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	313.5059 (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	130.4287	115.7831	123.8429	110.5911	108.4274	99.0082	98.5323	101.6249	101.8590	112.0437	117.3010	129.2026	129.2026 (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	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.1437	67.6301	55.0005	41.6389	31.1256	26.2775	28.3938	36.9073	49.5370	62.8986	73.4119	78.2600 (67)

Full SAP Calculation Printout



Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	763.0833	771.0017	751.0476	708.5675	654.9441	604.5457	570.8764	562.9580	582.9122	625.3922	679.0156	729.4141 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424 (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)	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137 (71)
Water heating gains (Table 5)	175.3074	172.2963	166.4555	153.5988	145.7357	137.5114	132.4358	136.5927	141.4708	150.5964	162.9180	173.6594 (72)
Total internal gains	1136.4836	1132.8775	1094.4529	1025.7545	953.7547	890.2838	853.6553	858.4073	895.8692	960.8364	1037.2948	1103.2827 (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	3.0900	10.6334	0.7600	0.7000	0.7700	12.1137 (74)						
East	19.7100	19.6403	0.7600	0.7000	0.7700	142.7180 (76)						
South	2.5400	46.7521	0.7600	0.7000	0.7700	43.7804 (78)						
West	26.5700	19.6403	0.7600	0.7000	0.7700	192.3905 (80)						
East	1.9200	26.0000	0.7600	0.7000	1.0000	23.9017 (82)						
West	2.8800	26.0000	0.7600	0.7000	1.0000	35.8525 (82)						
Solar gains	450.7568	874.4992	1430.8892	2085.6620	2563.5730	2629.6032	2501.1655	2141.9348	1662.6071	1034.4344	560.5213	371.7688 (83)
Total gains	1587.2405	2007.3766	2525.3421	3111.4166	3517.3277	3519.8871	3354.8208	3000.3421	2558.4763	1995.2708	1597.8161	1475.0515 (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	53.7681	53.8929	54.0158	54.6007	54.7115	55.2335	55.2335	55.3312	55.0313	54.7115	54.4878	54.2558
alpha	4.5845	4.5929	4.6011	4.6400	4.6474	4.6822	4.6822	4.6887	4.6688	4.6474	4.6325	4.6171
util living area	0.9979	0.9937	0.9768	0.9126	0.7696	0.5795	0.4301	0.4972	0.7767	0.9665	0.9954	0.9985 (86)
Living	19.7124	19.8985	20.2035	20.5692	20.8117	20.9089	20.9288	20.9244	20.8409	20.4697	20.0143	19.6825
Non living	18.6038	18.8430	19.2315	19.6884	19.9639	20.0644	20.0791	20.0782	20.0051	19.5774	18.9985	18.5709
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	3	0	0	0	0	0	0	0	0	0	31
16 / 9	0	25	31	2	0	0	0	0	0	0	30	0
MIT	21.0000	20.4430	20.5489	20.5816	20.8117	20.9089	20.9288	20.9244	20.8409	20.4697	20.4417	21.0000 (87)
Th 2	20.1453	20.1471	20.1489	20.1572	20.1588	20.1661	20.1661	20.1675	20.1633	20.1588	20.1556	20.1523 (88)
util rest of house	0.9974	0.9921	0.9711	0.8923	0.7242	0.5122	0.3510	0.4119	0.7146	0.9551	0.9941	0.9982 (89)
MIT 2	20.1453	19.6332	19.7440	19.7059	19.9639	20.0644	20.0791	20.0782	20.0051	19.5774	19.6449	20.1523 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.2602	19.7421	19.8522	19.8236	20.0779	20.1780	20.1933	20.1920	20.1175	19.6974	19.7521	20.2663 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2602	19.7421	19.8522	19.8236	20.0779	20.1780	20.1933	20.1920	20.1175	19.6974	19.7521	20.2663 (93)

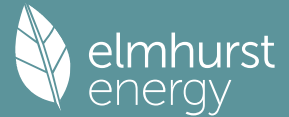
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9975	0.9912	0.9687	0.8829	0.7195	0.5132	0.3536	0.4145	0.7109	0.9469	0.9933	0.9982 (94)
Useful gains	1583.2712	1989.7633	2446.4005	2747.2198	2530.7721	1806.4047	1186.2313	1243.5908	1818.7824	1889.3415	1587.1001	1472.4259 (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	5440.0743	5047.2363	4530.2553	3666.5665	2806.3892	1850.8281	1192.3022	1255.9875	2004.0070	3047.3882	4255.5245	5427.0129 (97)
Space heating kWh	2869.4615	2054.6219	1550.3880	661.9296	205.0591	0.0000	0.0000	0.0000	0.0000	861.5867	1921.2656	2942.2128 (98a)
Space heating requirement - total per year (kWh/year)												13066.5252
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	2869.4615	2054.6219	1550.3880	661.9296	205.0591	0.0000	0.0000	0.0000	0.0000	861.5867	1921.2656	2942.2128 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13066.5252
Space heating per m2												(98c) / (4) =
												35.5059 (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 %)												345.1228 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												65.0000 (208)
Space heating requirement	2869.4615	2054.6219	1550.3880	661.9296	205.0591	0.0000	0.0000	0.0000	0.0000	861.5867	1921.2656	2942.2128 (98)
Space heating efficiency (main heating system 1)	345.1228	345.1228	345.1228	345.1228	345.1228	0.0000	0.0000	0.0000	0.0000	345.1228	345.1228	345.1228 (210)
Space heating fuel (main heating system)	831.4321	595.3307	449.2279	191.7954	59.4163	0.0000	0.0000	0.0000	0.0000	249.6464	556.6905	852.5119 (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	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059 (64)

Full SAP Calculation Printout



1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	155.8300 (1b)	x 2.3600 (2b)	= 367.7588 (1b) - (3b)
First floor	150.2700 (1c)	x 2.8500 (2c)	= 428.2695 (1c) - (3c)
Second floor	61.9100 (1d)	x 2.0200 (2d)	= 125.0582 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	368.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 921.0865 (5)

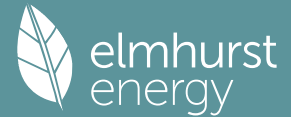
2. Ventilation rate

	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) = 0.0869 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2869 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2869 (21)
Wind speed	Jan 4.3000 Feb 4.1000 Mar 4.1000 Apr 3.7000 May 3.6000 Jun 3.4000 Jul 3.4000 Aug 3.2000 Sep 3.2000 Oct 3.4000 Nov 3.4000 Dec 3.7000 (22)
Wind factor	Jan 1.0750 Feb 1.0250 Mar 1.0250 Apr 0.9250 May 0.9000 Jun 0.8500 Jul 0.8500 Aug 0.8000 Sep 0.8000 Oct 0.8500 Nov 0.8500 Dec 0.9250 (22a)
Adj infilt rate	Jan 0.3084 Feb 0.2940 Mar 0.2940 Apr 0.2653 May 0.2582 Jun 0.2438 Jul 0.2438 Aug 0.2295 Sep 0.2295 Oct 0.2438 Nov 0.2438 Dec 0.2653 (22b)
Effective ac	Jan 0.5475 Feb 0.5432 Mar 0.5432 Apr 0.5352 May 0.5333 Jun 0.5297 Jul 0.5297 Aug 0.5263 Sep 0.5263 Oct 0.5297 Nov 0.5297 Dec 0.5352 (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					
Front Door			2.0400	1.2000	2.4480		(26a)					
Windows (Uw = 1.00)			51.9100	0.9615	49.9135		(27)					
East Velux			1.9200	1.1450	2.1985		(27a)					
West Velux			2.8800	1.1450	3.2977		(27a)					
Heatloss Floor 1			155.8300	0.1200	18.6996	110.0000	17141.3000 (28a)					
External Wall 1	392.4600	53.9500	338.5100	0.1500	50.7765	110.0000	37236.1000 (29a)					
Dormer Cheeks	4.7100		4.7100	0.1600	0.7536	18.0000	84.7800 (29a)					
Rafter	60.7400	4.8000	55.9400	0.1100	6.1534	9.0000	503.4600 (30)					
Flat Main	47.7600		47.7600	0.1100	5.2536	9.0000	429.8400 (30)					
Dormer Roofs	1.7500		1.7500	0.1100	0.1925	9.0000	15.7500 (30)					
Total net area of external elements Aum(A, m2)			663.2500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 139.6868		(33)					
Internal Wall 1			531.8800			9.0000	4786.9200 (32c)					
Internal Floor 1			150.2700			18.0000	2704.8600 (32d)					
Internal Floor 2			61.9100			18.0000	1114.3800 (32d)					
Internal Ceiling 1			155.8300			9.0000	1402.4700 (32e)					
Internal Ceiling 2			61.9100			9.0000	557.1900 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 65977.0500 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.2806 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value		Total					
E2 Other lintels (including other steel lintels)				37.1200	0.0060		0.2227					
E3 Sill				36.1200	0.0190		0.6863					
E4 Jamb				77.2400	0.0060		0.4634					
E5 Ground floor (normal)				49.4400	0.0930		4.5979					
E6 Intermediate floor within a dwelling				104.1600	0.0000		0.0000					
E16 Corner (normal)				92.3900	0.0350		3.2337					
R1 Head of roof window				6.8600	0.1130		0.7752					
R2 Sill of roof window				6.8600	0.1180		0.8095					
R3 Jamb of roof window				13.7200	0.8800		12.0736					
E17 Corner (inverted - internal area greater than external area)				69.8000	0.0550		3.8390					
E11 Eaves (insulation at rafter level)				55.4600	0.0200		1.1092					
E13 Gable (insulation at rafter level)				15.6100	0.0670		1.0459					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							28.8563 (36)					
Point Thermal bridges							(36a) = 0.0000					
Total fabric heat loss							(33) + (36) + (36a) = 168.5432 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 166.4311	Feb 165.1180	Mar 165.1180	Apr 162.6794	May 162.1088	Jun 161.0146	Jul 161.0146	Aug 159.9829	Sep 159.9829	Oct 161.0146	Nov 161.0146	Dec 162.6794 (38)
Heat transfer coeff	334.9743	333.6612	333.6612	331.2226	330.6520	329.5578	329.5578	328.5261	328.5261	329.5578	329.5578	331.2226 (39)
Average = Sum(39)m / 12 =												330.8898
HLP	Jan 0.9102	Feb 0.9067	Mar 0.9067	Apr 0.9000	May 0.8985	Jun 0.8955	Jul 0.8955	Aug 0.8927	Sep 0.8927	Oct 0.8955	Nov 0.8955	Dec 0.9000 (40)
HLP (average)												0.8991
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Full SAP Calculation Printout



4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.2203 (42)	
Hot water usage for mixer showers												84.8715 (42a)	
Hot water usage for baths												33.6439 (42b)	
Hot water usage for other uses												47.6095 (42c)	
Average daily hot water use (litres/day)												153.1300 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	166.5655	163.0525	158.7495	152.1467	146.8064	141.0564	138.8028	143.0867	147.6110	153.6531	160.3594	166.1249	(44)
Distribution loss (46)m = 0.15 x (45)m	263.7990	232.1846	243.9921	208.2813	197.6296	173.4453	167.8699	177.1712	182.0191	208.5059	228.4613	260.1115	(45)
Water storage loss:												Total = Sum(45)m = 2543.4707	
Store volume												300.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.9720 (55)	
Total storage loss													
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
Primary loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
WWHRS	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Electric shower(s)	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	(64)
Heat gains from water heating, kWh/month												Total per year (kWh/year) = Sum(64)m = 3172.1467 (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)	
	130.4287	115.7831	123.8429	110.5911	108.4274	99.0082	98.5323	101.6249	101.8590	112.0437	117.3010	129.2026	(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	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	193.2206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.1437	67.6301	55.0005	41.6389	31.1256	26.2775	28.3938	36.9073	49.5370	62.8986	73.4119	78.2600	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	763.0833	771.0017	751.0476	708.5675	654.9441	604.5457	570.8764	562.9580	582.9122	625.3922	679.0156	729.4141	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	57.5424	(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)	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	-128.8137	(71)
Water heating gains (Table 5)	175.3074	172.2963	166.4555	153.5988	145.7357	137.5114	132.4358	136.5927	141.4708	150.5964	162.9180	173.6594	(72)
Total internal gains	1136.4836	1132.8775	1094.4529	1025.7545	953.7547	890.2838	853.6553	858.4073	895.8692	960.8364	1037.2948	1103.2827	(73)

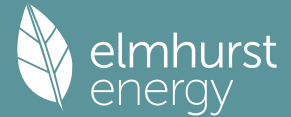
6. Solar gains

[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	3.0900	12.3370	0.7600	0.7000	0.7700	14.0545 (74)							
East	19.7100	23.0226	0.7600	0.7000	0.7700	167.2959 (76)							
South	2.5400	52.2144	0.7600	0.7000	0.7700	48.8955 (78)							
West	26.5700	23.0226	0.7600	0.7000	0.7700	225.5227 (80)							
East	1.9200	31.0000	0.7600	0.7000	1.0000	28.4982 (82)							
West	2.8800	31.0000	0.7600	0.7000	1.0000	42.7473 (82)							
Solar gains	527.0140	874.9782	1454.1258	2172.9057	2582.4046	2846.4771	2679.5632	2323.8146	1812.0426	1156.0233	649.8886	416.4581	(83)
Total gains	1663.4976	2007.8557	2548.5786	3198.6602	3536.1593	3736.7610	3533.2185	3182.2219	2707.9117	2116.8597	1687.1834	1519.7408	(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	54.7115	54.9268	54.9268	55.3312	55.4267	55.6108	55.6108	55.7854	55.7854	55.6108	55.6108	55.3312	(86)
alpha	4.6474	4.6618	4.6618	4.6887	4.6951	4.7074	4.7074	4.7190	4.7190	4.7074	4.7074	4.6887	(87)
util living area	0.9973	0.9933	0.9742	0.8982	0.7467	0.5241	0.3799	0.4288	0.7377	0.9548	0.9939	0.9982	(86)
Living	19.7901	19.9456	20.2507	20.6146	20.8338	20.9188	20.9315	20.9298	20.8636	20.5331	20.0849	19.7538	(88)
Non living	18.7136	18.9146	19.3012	19.7506	19.9961	20.0771	20.0859	20.0876	20.0355	19.6650	19.1008	18.6739	(89)
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	(90)
24 / 9	31	0	0	0	0	0	0	0	0	0	0	30	(91)
16 / 9	0	28	31	0	0	0	0	0	0	0	30	1	(92)
MIT	21.0000	20.4028	20.5756	20.6146	20.8338	20.9188	20.9315	20.9298	20.8636	20.5331	20.4817	20.9772	(87)
Th 2	20.1588	20.1618	20.1618	20.1675	20.1688	20.1713	20.1713	20.1737	20.1737	20.1713	20.1713	20.1675	(88)
util rest of house	0.9966	0.9916	0.9679	0.8753	0.6989	0.4580	0.3043	0.3467	0.6728	0.9399	0.9921	0.9978	(89)

Full SAP Calculation Printout



MIT 2	20.1588	19.6113	19.7820	19.7506	19.9961	20.0771	20.0859	20.0876	20.0355	19.6650	19.6988	20.1462 (90)
Living area fraction									FLA = Living area / (4) =			0.1345 (91)
MIT	20.2719	19.7178	19.8887	19.8668	20.1088	20.1903	20.1996	20.2009	20.1469	19.7818	19.8041	20.2580 (92)
Temperature adjustment												0.0000 (93)
adjusted MIT	20.2719	19.7178	19.8887	19.8668	20.1088	20.1903	20.1996	20.2009	20.1469	19.7818	19.8041	20.2580 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9905	0.9654	0.8659	0.6952	0.4596	0.3069	0.3495	0.6706	0.9310	0.9911	0.9978	(94)
Useful gains	1658.0452	1988.8750	2460.5187	2769.6068	2458.3627	1717.4259	1084.4691	1112.0746	1815.7966	1970.8955	1672.2048	1516.4277	(95)
Ext temp.	4.6000	5.1000	6.7000	9.1000	12.0000	14.9000	16.9000	16.8000	14.2000	10.8000	7.3000	4.5000	(96)
Heat loss rate W	5249.6953	4877.3841	4400.5593	3566.2167	2681.1817	1743.4630	1087.4070	1117.2783	1953.7115	2960.0070	4120.8268	5219.3923	(97)
Space heating kWh	2672.1877	1941.0781	1443.3902	573.5591	165.7774	0.0000	0.0000	0.0000	0.0000	735.8989	1763.0079	2755.0057	(98a)
Space heating requirement - total per year (kWh/year)												12049.9050	
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	2672.1877	1941.0781	1443.3902	573.5591	165.7774	0.0000	0.0000	0.0000	0.0000	735.8989	1763.0079	2755.0057	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12049.9050	
Space heating per m2												32.7434	(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 %)													345.0076 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													65.0000 (208)
Space heating requirement	2672.1877	1941.0781	1443.3902	573.5591	165.7774	0.0000	0.0000	0.0000	0.0000	735.8989	1763.0079	2755.0057	(98)
Space heating efficiency (main heating system 1)	345.0076	345.0076	345.0076	345.0076	345.0076	0.0000	0.0000	0.0000	0.0000	345.0076	345.0076	345.0076	(210)
Space heating fuel (main heating system)	774.5300	562.6189	418.3647	166.2453	48.0503	0.0000	0.0000	0.0000	0.0000	213.2993	511.0055	798.5347	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	317.1934	280.4118	297.3865	259.9533	251.0240	225.1173	221.2643	230.5656	233.6911	261.9003	280.1333	313.5059	(64)
Efficiency of water heater (217)m	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	169.7297	(216)
Fuel for water heating, kWh/month	186.8814	165.2108	175.2118	153.1572	147.8963	132.6328	130.3627	135.8428	137.6843	154.3043	165.0467	184.7089	(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	66.6481	53.4676	48.1416	35.2706	27.2441	22.2586	24.8529	32.3048	41.9607	55.0547	62.1842	68.5005	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-103.4208	-134.0953	-200.6245	-224.3309	-229.8328	-216.3874	-212.1368	-200.5309	-177.0968	-160.6374	-113.3840	-85.5393	(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	-35.1945	-63.9939	-142.7686	-248.9896	-337.0064	-383.1244	-373.0850	-316.2073	-228.2015	-122.3881	-49.6858	-25.5916	(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													3492.6489 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													169.7297
Water heating fuel used													1868.9399 (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)													537.8885 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-4384.2536 (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													1515.2237 (238)

10a. Fuel costs - using BEDF prices (536)

	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3492.6489	878.7505	(240)
Total CO2 associated with community systems	25.1600	0.0000	(473)

Full SAP Calculation Printout



Water heating (other fuel)	1868.9399	25.1600	470.2253 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	537.8885	25.1600	135.3328 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2058.0170	25.1600	-517.7971
PV Unit electricity exported	-2326.2367	5.8100	-135.1544
Total			-652.9514 (252)
Total energy cost			831.3571 (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	3492.6489	0.1565	546.7246 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1868.9399	0.1410	263.5396 (264)
Space and water heating			810.2643 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	537.8885	0.1443	77.6339 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2058.0170	0.1350	-277.9152
PV Unit electricity exported	-2326.2367	0.1227	-285.3832
Total			-563.2983 (269)
Total CO2, kg/year			324.5999 (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	3492.6489	1.5795	5516.6495 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1868.9399	1.5214	2843.4243 (278)
Space and water heating			8360.0738 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	537.8885	1.5338	825.0314 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2058.0170	1.4991	-3085.2074
PV Unit electricity exported	-2326.2367	0.4501	-1047.0545
Total			-4132.2620 (283)
Total Primary energy kWh/year			5052.8432 (286)