

Full SAP Calculation Printout



Plot Reference	01			Issued on Date	05/08/2026
Assessment Reference	01 ashp + PV	Plot Type Ref			
Plot Address	Flat 1, 2-4 Church St, Caversham, Reading, RG4 8AT			SAP Version	10.2
SAP Rating	87 B	DER	2.94	TER	11.39
Environmental	98 A	% DER < TER			74.19
CO ₂ Emissions (t/year)	0.19	DFEE	29.83	TFEE	35.90
Compliance Check	See BREL	% DFEE < TFEE			16.91
% DPER < TPER	40.92	DPER	35.21	TPER	59.59
Assessor Details	Mrs. Nicola Battista			Assessor ID	L706-0001
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)
Main dwelling			
Ground floor	78.1800 (1b)	2.3900 (2b)	186.8502 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800		186.8502 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 186.8502 (5)

2. Ventilation rate

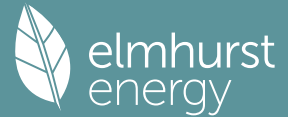
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1606 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4106 (18)
Number of sides sheltered	4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2874 (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	0.3664	0.3592	0.3521	0.3161	0.3089	0.2730	0.2730	0.2658	0.2874	0.3089	0.3233	0.3377 (22b)
Effective ac	0.5671	0.5645	0.5620	0.5500	0.5477	0.5373	0.5373	0.5353	0.5413	0.5477	0.5523	0.5570 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Opening Type 1			1.8900	1.4000	2.6460		(26)
Opening Type 2			9.2100	1.1450	10.5458		(27)
Heatloss Floor 1			78.1800	0.1000	7.8180	75.0000	5863.5000 (28a)
External Wall 1	85.9200	9.2100	76.7100	0.1800	13.8078	60.0000	4602.6000 (29a)
External Wall 2	13.0700	1.8900	11.1800	0.1700	1.9006	190.0000	2124.2000 (29a)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.7182		(33)
Main dwelling							
Party Ceiling 1			78.1800			100.0000	7818.0000 (32b)
Internal Wall 1			149.1400			9.0000	1342.2600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21750.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							278.2113 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.4400	0.0500	0.3220	
E3 Sill				5.5400	0.0240	0.1330	
E4 Jamb				16.4000	0.0190	0.3116	
E5 Ground floor (normal)				41.4200	0.0310	1.2840	
E16 Corner (normal)				11.9500	0.0400	0.4780	

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E17 Corner (inverted - internal area greater than external area) 2.3900 -0.0820 -0.1960
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.3326 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0508 (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 34.9697 34.8090 34.6514 33.9114 33.7729 33.1284 33.1284 33.0090 33.3766 33.7729 34.0530 34.3458 (38)
Average = Sum(39)m / 12 = 74.0205 73.8598 73.7022 72.9622 72.8237 72.1792 72.1792 72.0598 72.4274 72.8237 73.1038 73.3966 (39)
72.9615
HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 0.9468 0.9447 0.9427 0.9333 0.9315 0.9232 0.9232 0.9217 0.9264 0.9315 0.9351 0.9388 (40)
Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4274 (42)
Hot water usage for mixer showers 64.9196 63.9439 62.5223 59.8022 57.7948 55.5562 54.2838 55.6947 57.2413 59.6449 62.4234 64.6708 (42a)
Hot water usage for baths 28.0408 27.6243 27.0379 25.9566 25.1469 24.2491 23.7642 24.3465 24.9806 25.9413 27.0448 27.9460 (42b)
Hot water usage for other uses 39.4892 38.0532 36.6173 35.1813 33.7453 32.3094 32.3094 33.7453 35.1813 36.6173 38.0532 39.4892 (42c)
Average daily hot water use (litres/day) 121.7512 (43)
Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 132.4495 129.6215 126.1774 120.9401 116.6871 112.1147 110.3574 113.7866 117.4032 122.2034 127.5215 132.1060 (44)
Energy content (annual) 209.7677 184.5793 193.9300 165.5609 157.0832 137.8582 133.4677 140.8916 144.7699 165.8289 181.6777 206.8461 (45)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 2022.2613
31.4652 27.6869 29.0895 24.8341 23.5625 20.6787 20.0202 21.1337 21.7155 24.8743 27.2517 31.0269 (46)
Water storage loss (or HIU loss): 150.0000 (47)
Store volume 1.8600 (48)
a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)
Temperature factor from Table 2b 1.0044 (55)
Enter (49) or (54) in (55)
Total storage loss 31.1364 28.1232 31.1364 30.1320 31.1364 30.1320 31.1364 31.1364 30.1320 31.1364 30.1320 31.1364 (56)
If cylinder contains dedicated solar storage 31.1364 28.1232 31.1364 30.1320 31.1364 30.1320 31.1364 31.1364 30.1320 31.1364 30.1320 31.1364 (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 264.1665 233.7137 248.3288 218.2049 211.4820 190.5022 187.8665 195.2904 197.4139 220.2277 234.3217 261.2449 (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 264.1665 233.7137 248.3288 218.2049 211.4820 190.5022 187.8665 195.2904 197.4139 220.2277 234.3217 261.2449 (64)
Total per year (kWh/year) = Sum(64)m = 2662.7633 (64)
2663 (64)
12Total per year (kWh/year)
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 113.2668 100.6801 108.0008 97.1642 95.7492 87.9530 87.8970 90.3655 90.2512 98.6572 102.5230 112.2954 (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 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 121.1943 134.1794 121.1943 125.2341 121.1943 125.2341 121.1943 121.1943 125.2341 121.1943 125.2341 121.1943 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 215.5947 217.8319 212.1943 200.1923 185.0421 170.8029 161.2903 159.0531 164.6908 176.6927 191.8430 206.0821 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 (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) -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 (71)
Water heating gains (Table 5) 152.2403 149.8216 145.1623 134.9503 128.6952 122.1570 118.1412 121.4590 125.3489 132.6037 142.3931 150.9346 (72)
Total internal gains 548.4407 561.2443 537.9622 519.7881 494.3429 477.6054 460.0372 461.1178 474.6851 489.9021 518.8816 537.6224 (73)

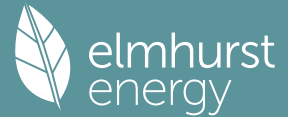
6. Solar gains

[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
East 2.7500 19.6403 0.6300 0.7000 16.5064 (76)
West 6.4600 19.6403 0.6300 0.7000 38.7750 (80)
Solar gains 55.2814 108.1421 178.0946 259.7404 318.3216 325.8588 310.2308 266.4837 207.1314 128.3197 68.9294 45.4607 (83)
Total gains 603.7221 669.3864 716.0568 779.5284 812.6645 803.4641 770.2680 727.6015 681.8165 618.2218 587.8109 583.0831 (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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.6236	81.8013	81.9761	82.8076	82.9650	83.7059	83.7059	83.8445	83.4190	82.9650	82.6472	82.3174
alpha	6.4416	6.4534	6.4651	6.5205	6.5310	6.5804	6.5804	6.5896	6.5613	6.5310	6.5098	6.4878
util living area	0.9949	0.9891	0.9739	0.9145	0.7768	0.5684	0.4116	0.4542	0.7048	0.9377	0.9879	0.9959 (86)
Living	20.1719	20.3130	20.5158	20.7780	20.9399	20.9932	20.9993	20.9987	20.9749	20.7679	20.4314	20.1487
Non living	19.1715	19.3515	19.6065	19.9250	20.0946	20.1443	20.1476	20.1487	20.1302	19.9213	19.5090	19.1472
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5764	20.3130	20.5158	20.7780	20.9399	20.9932	20.9993	20.9987	20.9749	20.7679	20.4314	20.2678 (87)
Th 2	20.1279	20.1296	20.1313	20.1393	20.1408	20.1478	20.1478	20.1491	20.1451	20.1408	20.1378	20.1346 (88)
util rest of house	0.9932	0.9855	0.9650	0.8879	0.7225	0.4958	0.3323	0.3710	0.6291	0.9121	0.9831	0.9945 (89)
MIT 2	19.7466	19.3515	19.6065	19.9250	20.0946	20.1443	20.1476	20.1487	20.1302	19.9213	19.5090	19.3252 (90)
Living area fraction									fLA = Living area /	(4) =		0.3694 (91)
MIT	20.0531	19.7067	19.9424	20.2401	20.4069	20.4579	20.4622	20.4627	20.4422	20.2341	19.8497	19.6734 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0531	19.7067	19.9424	20.2401	20.4069	20.4579	20.4622	20.4627	20.4422	20.2341	19.8497	19.6734 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9930	0.9832	0.9627	0.8914	0.7401	0.5226	0.3616	0.4018	0.6564	0.9153	0.9810	0.9935 (94)
Useful gains	599.4970	658.1673	689.3602	694.8765	601.4851	419.8638	278.5490	292.3200	447.5254	565.8759	576.6625	579.3037 (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	1166.0537	1093.6166	990.7348	827.3980	634.0686	422.8175	278.7707	292.7544	459.3511	701.5875	932.0548	1135.6929 (97)
Space heating kWh	421.5182	292.6219	224.2227	95.4154	24.2421	0.0000	0.0000	0.0000	0.0000	100.9694	255.8825	413.9536 (98a)
Space heating requirement - total per year (kWh/year)												1828.8259
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	421.5182	292.6219	224.2227	95.4154	24.2421	0.0000	0.0000	0.0000	0.0000	100.9694	255.8825	413.9536 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1828.8259
Space heating per m2										(98c) / (4) =		23.3925 (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 %)												217.7941 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	421.5182	292.6219	224.2227	95.4154	24.2421	0.0000	0.0000	0.0000	0.0000	100.9694	255.8825	413.9536 (98)
Space heating efficiency (main heating system 1)	217.7941	217.7941	217.7941	217.7941	217.7941	0.0000	0.0000	0.0000	0.0000	217.7941	217.7941	217.7941 (210)
Space heating fuel (main heating system)	193.5397	134.3571	102.9517	43.8099	11.1307	0.0000	0.0000	0.0000	0.0000	46.3600	117.4882	190.0664 (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	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449 (64)
Efficiency of water heater (217)m	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819 (216)
Fuel for water heating, kWh/month	149.5153	132.2794	140.5514	123.5016	119.6965	107.8221	106.3304	110.5322	111.7341	124.6465	132.6235	147.8617 (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	22.2651	17.8619	16.0827	11.7829	9.1014	7.4359	8.3026	10.7921	14.0178	18.3921	20.7739	22.8840 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-25.0483	-38.0150	-58.4715	-69.0898	-77.0550	-72.6585	-71.6712	-65.8571	-55.8148	-44.3223	-28.2400	-21.3169 (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	-6.2558	-14.2225	-30.4949	-50.1427	-70.2467	-72.1626	-71.2360	-59.0017	-41.9746	-22.4563	-8.8911	-4.8793 (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												839.7039 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.6819
Water heating fuel used												1507.0949 (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)												179.6924 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1079.5246 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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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	1446.9666 (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	839.7039	0.1567	131.5563 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1507.0949	0.1409	212.3328 (264)
Space and water heating			343.8891 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	179.6924	0.1443	25.9352 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-627.5603	0.1335	-83.7892
PV Unit electricity exported	-451.9643	0.1236	-55.8688
Total			-139.6579 (269)
Total CO2, kg/year			230.1663 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9400 (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	839.7039	1.5800	1326.7291 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1507.0949	1.5210	2292.2237 (278)
Space and water heating			3618.9528 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	179.6924	1.5338	275.6182 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-627.5603	1.4934	-937.1966
PV Unit electricity exported	-451.9643	0.4536	-205.0301
Total			-1142.2267 (283)
Total Primary energy kWh/year			2752.3444 (286)
Dwelling Primary energy Rate (DPER)			35.2100 (287)

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

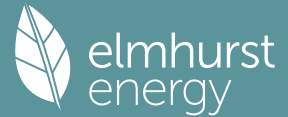
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	78.1800	2.3900	186.8502
Ground floor	(1b)	x	(2b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	186.8502

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1606 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4106 (18)
Number of sides sheltered	4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2874 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.3664 0.3592 0.3521 0.3161 0.3089 0.2730 0.2730 0.2658 0.2874 0.3089 0.3233 0.3377 (22b)
Effective ac	0.5671 0.5645 0.5620 0.5500 0.5477 0.5373 0.5373 0.5353 0.5413 0.5477 0.5523 0.5570 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			9.2100	1.1450	10.5458		(27)
Heatloss Floor 1			78.1800	0.1300	10.1634		(28a)
External Wall 1	85.9200	9.2100	76.7100	0.1800	13.8078		(29a)
External Wall 2	13.0700	1.8900	11.1800	0.1800	2.0124		(29a)
Total net area of external elements Aum(A, m2)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.4194		(33)

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

278.2113 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.4400	0.0500	0.3220
E3 Sill	5.5400	0.0500	0.2770
E4 Jamb	16.4000	0.0500	0.8200
E5 Ground floor (normal)	41.4200	0.1600	6.6272
E16 Corner (normal)	11.9500	0.0900	1.0755
E17 Corner (inverted - internal area greater than external area)	2.3900	-0.0900	-0.2151

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

8.9066 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 47.3260 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.9697	34.8090	34.6514	33.9114	33.7729	33.1284	33.1284	33.0090	33.3766	33.7729	34.0530	34.3458
Heat transfer coeff	82.2957	82.1350	81.9774	81.2374	81.0989	80.4544	80.4544	80.3350	80.7026	81.0989	81.3790	81.6718
Average = Sum(39)m / 12 =												81.2367

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0526	1.0506	1.0486	1.0391	1.0373	1.0291	1.0291	1.0276	1.0323	1.0373	1.0409	1.0447
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.4274 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	64.9196	63.9439	62.5223	59.8022	57.7948	55.5562	54.2838	55.6947	57.2413	59.6449	62.4234	64.6708
Hot water usage for baths	28.0408	27.6243	27.0379	25.9566	25.1469	24.2491	23.7642	24.3465	24.9806	25.9413	27.0448	27.9460
Hot water usage for other uses	39.4892	38.0532	36.6173	35.1813	33.7453	32.3094	32.3094	33.7453	35.1813	36.6173	38.0532	39.4892
Average daily hot water use (litres/day)												121.7512

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	132.4495	129.6215	126.1774	120.9401	116.6871	112.1147	110.3574	113.7866	117.4032	122.2034	127.5215	132.1060
Energy conte	209.7677	184.5793	193.9300	165.5609	157.0832	137.8582	133.4677	140.8916	144.7699	165.8289	181.6777	206.8461
Energy content (annual)												2022.2613

Distribution loss (46)m = 0.15 x (45)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Distribution loss (46)m	31.4652	27.6869	29.0895	24.8341	23.5625	20.6787	20.0202	21.1337	21.7155	24.8743	27.2517	31.0269

Water storage loss (or HIU loss):

Store volume

a) If manufacturer declared loss factor is known (kWh/day):

Temperature factor from Table 2b

Enter (49) or (54) in (55)

Total storage loss

23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 (56)

If cylinder contains dedicated solar storage

23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 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

256.3626 226.6650 240.5249 210.6528 203.6781 182.9500 180.0626 187.4865 189.8618 212.4238 226.7696 253.4410 (62)

WWHRS -29.6785 -26.2479 -27.4853 -22.7589 -21.2105 -18.1500 -17.0127 -18.0913 -18.7787 -22.1380 -25.0796 -29.1289 (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 226.6841 200.4171 213.0396 187.8938 182.4676 164.8000 163.0499 169.3952 171.0831 190.2858 201.6899 224.3121 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2295.1184 (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 107.0237 95.0412 101.7577 91.1225 89.5061 81.9113 81.6539 84.1224 84.2095 92.4140 96.4813 106.0522 (65)

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

Metabolic gains (Table 5), Watts

(66)m 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 (66)

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

121.1943 134.1794 121.1943 125.2341 121.1943 125.2341 121.1943 121.1943 125.2341 121.1943 125.2341 121.1943 121.1943 (67)

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

215.5947 217.8319 212.1943 200.1923 185.0421 170.8029 161.2903 159.0531 164.6908 176.6927 191.8430 206.0821 206.0821 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 (69)

Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)

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

-97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 (71)

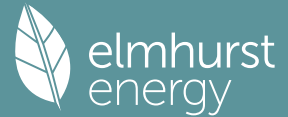
Water heating gains (Table 5)

143.8490 141.4303 136.7710 126.5590 120.3039 113.7657 109.7499 113.0677 116.9576 124.2124 134.0018 142.5433 142.5433 (72)

Total internal gains 543.0494 555.8530 532.5709 514.3968 488.9516 469.2141 451.6459 452.7265 466.2939 484.5108 513.4903 532.2311 532.2311 (73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF				Access factor Table 6d	Gains W
East				2.7500	19.6403	0.6300		0.7000				0.7700	16.5064 (76)
West				6.4600	19.6403	0.6300		0.7000				0.7700	38.7750 (80)

Solar gains	55.2814	108.1421	178.0946	259.7404	318.3216	325.8588	310.2308	266.4837	207.1314	128.3197	68.9294	45.4607 (83)	
Total gains	598.3308	663.9951	710.6656	774.1372	807.2732	795.0729	761.8767	719.2102	673.4252	612.8305	582.4197	577.6918 (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	73.4160	73.5597	73.7011	74.3724	74.4994	75.0963	75.0963	75.2078	74.8652	74.4994	74.2430	73.9768	
alpha	5.8944	5.9040	5.9134	5.9582	5.9666	6.0064	6.0064	6.0139	5.9910	5.9666	5.9495	5.9318	
util living area	0.9958	0.9914	0.9802	0.9368	0.8258	0.6300	0.4621	0.5092	0.7645	0.9544	0.9906	0.9966 (86)	
MIT	20.0037	20.1499	20.3699	20.6694	20.8876	20.9820	20.9976	20.9958	20.9461	20.6683	20.2893	19.9795 (87)	
Th 2	20.0397	20.0414	20.0431	20.0509	20.0523	20.0592	20.0592	20.0604	20.0565	20.0523	20.0494	20.0463 (88)	
util rest of house	0.9943	0.9884	0.9730	0.9143	0.7719	0.5453	0.3647	0.4077	0.6839	0.9332	0.9866	0.9954 (89)	
MIT 2	18.8896	19.0766	19.3550	19.7248	19.9630	20.0498	20.0585	20.0591	20.0233	19.7318	19.2610	18.8637 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	19.3012	19.4730	19.7299	20.0737	20.3046	20.3942	20.4054	20.4051	20.3642	20.0778	19.6409	19.2759 (92)	
Temperature adjustment	0.0000												
adjusted MIT	19.3012	19.4730	19.7299	20.0737	20.3046	20.3942	20.4054	20.4051	20.3642	20.0778	19.6409	19.2759 (93)	

8. Space heating requirement													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9860	0.9701	0.9149	0.7874	0.5763	0.4008	0.4454	0.7119	0.9339	0.9844	0.9940 (94)	
Useful gains	593.9873	654.7190	689.4058	708.2444	635.6139	458.1695	305.3909	320.3354	479.4018	572.3190	573.3502	574.2292 (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	1234.5313	1196.9570	1084.5533	907.7255	697.8223	466.1671	306.1588	321.7500	505.5362	768.6363	1020.5621	1231.2758 (97)	
Space heating kWh	476.5648	364.3839	293.9897	143.6264	46.2831	0.0000	0.0000	0.0000	0.0000	146.0600	321.9926	488.8427 (98a)	
Space heating requirement - total per year (kWh/year)	2281.7432												
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	476.5648	364.3839	293.9897	143.6264	46.2831	0.0000	0.0000	0.0000	0.0000	146.0600	321.9926	488.8427 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	2281.7432												
Space heating per m2	(98c) / (4) = 29.1858 (99)												

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	476.5648	364.3839	293.9897	143.6264	46.2831	0.0000	0.0000	0.0000	0.0000	146.0600	321.9926	488.8427 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	516.3215	394.7822	318.5154	155.6083	50.1442	0.0000	0.0000	0.0000	0.0000	158.2449	348.8544	529.6237 (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	226.6841	200.4171	213.0396	187.8938	182.4676	164.8000	163.0499	169.3952	171.0831	190.2858	201.6899	224.3121 (64)	
Efficiency of water heater (217)m	85.6850	85.3830	84.7823	83.4649	81.4707	79.8000	79.8000	79.8000	79.8000	83.4739	85.1034	79.8000 (216)	
Fuel for water heating, kWh/month	264.5551	234.7273	251.2783	225.1173	223.9673	206.5163	204.3232	212.2747	214.3899	227.9585	236.9940	261.5645 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	25.1818	20.2018	18.1895	13.3264	10.2937	8.4100	9.3902	12.2058	15.8541	20.8014	23.4952	25.8817 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-36.5407	-51.4869	-73.9554	-83.0828	-89.5227	-83.5344	-82.5170	-77.9550	-69.8599	-58.8709	-40.1696	-31.5962 (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	-20.6947	-43.5427	-86.5634	-130.0370	-171.9637	-172.7917	-170.7427	-144.5367	-105.9116	-62.2563	-27.6264	-16.3625 (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													

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Space heating fuel - main system 1	2472.0945 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2763.6663 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	203.2315 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1932.1212 (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	3592.8711 (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	2472.0945	0.2100	519.1398 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2763.6663	0.2100	580.3699 (264)
Space and water heating			1099.5098 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	203.2315	0.1443	29.3326 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.0916	0.1346	-104.8667
PV Unit electricity exported	-1153.0296	0.1259	-145.1570
Total			-250.0236 (269)
Total CO2, kg/year			890.7480 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3900 (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	2472.0945	1.1300	2793.4667 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2763.6663	1.1300	3122.9429 (278)
Space and water heating			5916.4097 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	203.2315	1.5338	311.7232 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.0916	1.4975	-1166.6618
PV Unit electricity exported	-1153.0296	0.4621	-532.8257
Total			-1699.4875 (283)
Total Primary energy kWh/year			4658.7462 (286)
Target Primary Energy Rate (TPER)			59.5900 (287)

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

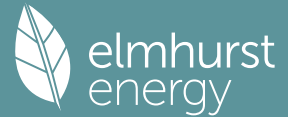
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	78.1800 (1b)	2.3900 (2b)	186.8502 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	186.8502 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	Air changes per hour
Pressure test	30.0000 / (5) = 0.1606 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	5.0000 (17)
Number of sides sheltered	0.4106 (18)
	4 (19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2874 (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	0.3664	0.3592	0.3521	0.3161	0.3089	0.2730	0.2730	0.2658	0.2874	0.3089	0.3233	0.3377	(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	0.5671	0.5645	0.5620	0.5500	0.5477	0.5373	0.5373	0.5353	0.5413	0.5477	0.5523	0.5570	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Opening Type 1			1.8900	1.4000	2.6460			(26)
Opening Type 2			9.2100	1.1450	10.5458			(27)
Heatloss Floor 1			78.1800	0.1000	7.8180	75.0000	5863.5000	(28a)
External Wall 1	85.9200	9.2100	76.7100	0.1800	13.8078	60.0000	4602.6000	(29a)
External Wall 2	13.0700	1.8900	11.1800	0.1700	1.9006	190.0000	2124.2000	(29a)
Total net area of external elements Aum(A, m2)			177.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.7182			(33)
Main dwelling								
Party Ceiling 1			78.1800			100.0000	7818.0000	(32b)
Internal Wall 1			149.1400			9.0000	1342.2600	(32c)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 21750.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								278.2113 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				6.4400	0.0500		0.3220	
E3 Sill				5.5400	0.0240		0.1330	
E4 Jamb				16.4000	0.0190		0.3116	
E5 Ground floor (normal)				41.4200	0.0310		1.2840	
E16 Corner (normal)				11.9500	0.0400		0.4780	
E17 Corner (inverted - internal area greater than external area)				2.3900	-0.0820		-0.1960	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								2.3326 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss								(33) + (36) + (36a) = 39.0508 (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	
	34.9697	34.8090	34.6514	33.9114	33.7729	33.1284	33.1284	33.0090	33.3766	33.7729	34.0530	34.3458	(38)
Heat transfer coeff	74.0205	73.8598	73.7022	72.9622	72.8237	72.1792	72.1792	72.0598	72.4274	72.8237	73.1038	73.3966	(39)
Average = Sum(39)m / 12 =												72.9615	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9468	0.9447	0.9427	0.9333	0.9315	0.9232	0.9232	0.9217	0.9264	0.9315	0.9351	0.9388	(40)
HLP (average)												0.9333	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

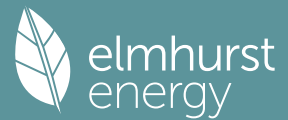
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4274 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	28.0408	27.6243	27.0379	25.9566	25.1469	24.2491	23.7642	24.3465	24.9806	25.9413	27.0448	27.9460 (42b)
Hot water usage for other uses												
	39.4892	38.0532	36.6173	35.1813	33.7453	32.3094	32.3094	33.7453	35.1813	36.6173	38.0532	39.4892 (42c)
Average daily hot water use (litres/day)												61.8975 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	67.5300	65.6776	63.6551	61.1379	58.8923	56.5585	56.0736	58.0919	60.1619	62.5585	65.0981	67.4352 (44)
Energy content (annual)	106.9510	93.5240	97.8356	83.6947	79.2803	69.5453	67.8161	71.9299	74.1856	84.8913	92.7441	105.5872 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1027.9851
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	90.9083	79.4954	83.1603	71.1405	67.3882	59.1135	57.6437	61.1404	63.0578	72.1576	78.8325	89.7491 (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	90.9083	79.4954	83.1603	71.1405	67.3882	59.1135	57.6437	61.1404	63.0578	72.1576	78.8325	89.7491 (64)
Total per year (kWh/year)												873.7873 (64)
Electric shower(s)												874 (64)
	51.9898	46.3233	50.5833	48.2710	49.1768	46.9099	48.4735	49.1768	48.2710	50.5833	49.6321	51.9898 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												591.3804 (64a)
Heat gains from water heating, kWh/month												
	35.7245	31.4547	33.4359	29.8529	29.1413	26.5058	26.5293	27.5793	27.8322	30.6852	32.1162	35.4347 (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	121.3710	121.3710	121.3710	121.3710	121.3710	121.3710	121.3710	121.3710	121.3710	121.3710	121.3710	121.3710 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	121.1943	134.1794	121.1943	125.2341	121.1943	125.2341	121.1943	125.2341	121.1943	125.2341	121.1943	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	215.5947	217.8319	212.1943	200.1923	185.0421	170.8029	161.2903	159.0531	164.6908	176.6927	191.8430	(68)
Pumps, fans	35.1371	35.1371	35.1371	35.1371	35.1371	35.1371	35.1371	35.1371	35.1371	35.1371	35.1371	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	(71)
Total internal gains	48.0168	46.8075	44.9407	41.4623	39.1684	36.8137	35.6577	37.0689	38.6558	41.2436	44.6058	(72)
	444.2172	458.2302	437.7406	426.3001	404.8161	392.2621	377.5536	376.7277	387.9921	398.5419	421.0942	(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
East					2.7500	19.6403	0.6300	0.7000			0.7700	16.5064 (76)
West					6.4600	19.6403	0.6300	0.7000			0.7700	38.7750 (80)
Solar gains	55.2814	108.1421	178.0946	259.7404	318.3216	325.8588	310.2308	266.4837	207.1314	128.3197	68.9294	45.4607 (83)
Total gains	499.4986	566.3723	615.8352	686.0405	723.1376	718.1208	687.7845	643.2114	595.1235	526.8616	490.0236	479.7758 (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	81.6236	81.8013	81.9761	82.8076	82.9650	83.7059	83.7059	83.8445	83.4190	82.9650	82.6472	82.3174
alpha	6.4416	6.4534	6.4651	6.5205	6.5310	6.5804	6.5804	6.5896	6.5613	6.5310	6.5098	6.4878
util living area	0.9983	0.9956	0.9878	0.9494	0.8372	0.6302	0.4602	0.5122	0.7814	0.9696	0.9955	0.9987 (86)
MIT	20.0389	20.1849	20.3997	20.6976	20.9061	20.9877	20.9986	20.9973	20.9546	20.6779	20.3101	20.0162 (87)
Th 2	20.1279	20.1296	20.1313	20.1393	20.1408	20.1478	20.1478	20.1491	20.1451	20.1408	20.1378	20.1346 (88)
util rest of house	0.9976	0.9940	0.9832	0.9309	0.7875	0.5523	0.3720	0.4192	0.7069	0.9547	0.9936	0.9982 (89)
MIT 2	19.2505	19.3972	19.6108	19.9023	20.0818	20.1428	20.1475	20.1484	20.1227	19.8902	19.5290	19.2334 (90)
Living area fraction	19.5418	19.6882	19.9022	20.1961	20.3863	20.4549	20.4619	20.4620	20.4300	20.1812	19.8175	19.5225 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5418	19.6882	19.9022	20.1961	20.3863	20.4549	20.4619	20.4620	20.4300	20.1812	19.8175	19.5225 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9971	0.9930	0.9817	0.9323	0.8027	0.5810	0.4047	0.4537	0.7333	0.9555	0.9926	0.9977 (94)
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	1128.2034	1092.2517	987.7726	824.1881	632.5665	422.6019	278.7478	292.7067	458.4658	697.7364	929.7002	1124.6234 (97)
Space heating kWh	468.8474	356.0557	285.1010	132.9136	38.7393	0.0000	0.0000	0.0000	0.0000	144.5613	319.1694	480.5822 (98a)
Space heating requirement - total per year (kWh/year)												2225.9699
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	468.8474	356.0557	285.1010	132.9136	38.7393	0.0000	0.0000	0.0000	0.0000	144.5613	319.1694	480.5822 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2225.9699
Space heating per m2										(98c) / (4) =		28.4724 (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	678.4842	534.1259	547.6546	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9218	0.9668	0.9493	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	625.4337	516.4061	519.8973	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	783.7617	750.9953	701.3700	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	113.9961	174.5344	135.0157	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	28.4990	43.6336	33.7539	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												105.8866 (107)
Energy for space heating												28.4724 (99)
Energy for space cooling												1.3544 (108)
Total												29.8268 (109)
Fabric Energy Efficiency (DFEE)												29.8 (109)

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1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.1800 (1b)	x 2.3900 (2b)	= 186.8502 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.8502 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1606 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4106	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2874 (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	0.3664	0.3592	0.3521	0.3161	0.3089	0.2730	0.2730	0.2658	0.2874	0.3089	0.3233	0.3377 (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	0.5671	0.5645	0.5620	0.5500	0.5477	0.5373	0.5373	0.5353	0.5413	0.5477	0.5523	0.5570 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			9.2100	1.1450	10.5458		(27)
Heatloss Floor 1			78.1800	0.1300	10.1634		(28a)
External Wall 1	85.9200	9.2100	76.7100	0.1800	13.8078		(29a)
External Wall 2	13.0700	1.8900	11.1800	0.1800	2.0124		(29a)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.4194		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 278.2113 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.4400	0.0500	0.3220
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E3 Sill	16.4000	0.0500	0.8200
E4 Jamb	41.4200	0.1600	6.6272
E5 Ground floor (normal)	11.9500	0.0900	1.0755
E16 Corner (normal)	2.3900	-0.0900	-0.2151
E17 Corner (inverted - internal area greater than external area)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.9066 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	47.3260 (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	34.9697	34.8090	34.6514	33.9114	33.7729	33.1284	33.1284	33.0090	33.3766	33.7729	34.0530	34.3458 (38)
Heat transfer coeff	82.2957	82.1350	81.9774	81.2374	81.0989	80.4544	80.4544	80.3350	80.7026	81.0989	81.3790	81.6718 (39)
Average = Sum(39)m / 12 =												81.2367

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0526	1.0506	1.0486	1.0391	1.0373	1.0291	1.0291	1.0276	1.0323	1.0373	1.0409	1.0447 (40)
HLP (average)												1.0391
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4274 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	28.0408	27.6243	27.0379	25.9566	25.1469	24.2491	23.7642	24.3465	24.9806	25.9413	27.0448	27.9460 (42b)
Hot water usage for other uses	39.4892	38.0532	36.6173	35.1813	33.7453	32.3094	32.3094	33.7453	35.1813	36.6173	38.0532	39.4892 (42c)
Average daily hot water use (litres/day)												61.8975 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	67.5300	65.6776	63.6551	61.1379	58.8923	56.5585	56.0736	58.0919	60.1619	62.5585	65.0981	67.4352 (44)
Energy conte	106.9510	93.5240	97.8356	83.6947	79.2803	69.5453	67.8161	71.9299	74.1856	84.8913	92.7441	105.5872 (45)

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Energy content (annual)	Total = Sum(45)m = 1027.9851									
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										
Water storage loss (or HIU loss):										
Total storage loss										
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000										
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										
Primary loss										
Combi loss										
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000										
Total heat required for water heating calculated for each month										
90.9083 79.4954 83.1603 71.1405 67.3882 59.1135 57.6437 61.1404 63.0578 72.1576 78.8325										
WWHRS										
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000										
PV diverter										
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000										
Solar input										
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000										
FGHRS										
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000										
Output from w/h										
90.9083 79.4954 83.1603 71.1405 67.3882 59.1135 57.6437 61.1404 63.0578 72.1576 78.8325										
12Total per year (kWh/year)										
Electric shower(s)										
51.9898 46.3233 50.5833 48.2710 49.1768 46.9099 48.4735 49.1768 48.2710 50.5833 49.6321										
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =										
591.3804 (64a)										
Heat gains from water heating, kWh/month										
35.7245 31.4547 33.4359 29.8529 29.1413 26.5058 26.5293 27.5793 27.8322 30.6852 32.1162										
35.4347 (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
121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710 121.3710												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
121.1943 134.1794 121.1943 125.2341 121.1943 125.2341 121.1943 121.1943 125.2341 121.1943 125.2341 121.1943												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
215.5947 217.8319 212.1943 200.1923 185.0421 170.8029 161.2903 159.0531 164.6908 176.6927 191.8430 206.0821												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371 35.1371												
Pumps, fans												
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000												
Losses e.g. evaporation (negative values) (Table 5)												
-97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968 -97.0968												
Water heating gains (Table 5)												
48.0168 46.8075 44.9407 41.4623 39.1684 36.8137 35.6577 37.0689 38.6558 41.2436 44.6058 47.6273												
Total internal gains												
444.2172 458.2302 437.7406 426.3001 404.8161 392.2621 377.5536 376.7277 387.9921 398.5419 421.0942 434.3151												

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	
East	2.7500	19.6403	0.6300	0.7000	0.7700	16.5064 (76)
West	6.4600	19.6403	0.6300	0.7000	0.7700	38.7750 (80)
Solar gains	55.2814	108.1421	178.0946	259.7404	318.3216	325.8588
Total gains	499.4986	566.3723	615.8352	686.0405	723.1376	718.1208

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
73.4160 73.5597 73.7011 74.3724 74.4994 75.0963 75.0963 75.2078 74.8652 74.4994 74.2430 73.9768												
alpha	5.8944	5.9040	5.9134	5.9582	5.9666	6.0064	6.0064	6.0139	5.9910	5.9666	5.9495	5.9318
util living area	0.9984	0.9962	0.9900	0.9614	0.8738	0.6865	0.5100	0.5656	0.8270	0.9765	0.9961	0.9987
MIT	19.8794	20.0294	20.2586	20.5852	20.8431	20.9719	20.9959	20.9926	20.9169	20.5779	20.1754	19.8558
Th 2	20.0397	20.0414	20.0431	20.0509	20.0523	20.0592	20.0592	20.0604	20.0565	20.0523	20.0494	20.0463
util rest of house	0.9978	0.9947	0.9861	0.9459	0.8270	0.5988	0.4036	0.4549	0.7520	0.9640	0.9944	0.9983
MIT 2	19.0199	19.1706	19.3990	19.7213	19.9506	20.0473	20.0582	20.0586	20.0139	19.7204	19.3229	19.0016
Living area fraction	19.3374	19.4878	19.7165	20.0404	20.2803	20.3889	20.4046	20.4036	20.3475	20.0372	19.6378	19.3171
MIT	19.3374	19.4878	19.7165	20.0404	20.2803	20.3889	20.4046	20.4036	20.3475	20.0372	19.6378	19.3171
Temperature adjustment												
adjusted MIT	19.3374	19.4878	19.7165	20.0404	20.2803	20.3889	20.4046	20.4036	20.3475	20.0372	19.6378	19.3171

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9972 0.9936 0.9844 0.9456 0.8395 0.6308 0.4431 0.4961 0.7773 0.9637 0.9933 0.9978												
Useful gains	498.0782	562.7717	606.2292	648.7520	607.0557	452.9789	304.7791	319.1214	462.6191	507.7536	486.7605	478.6969
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	1237.5133	1198.1721	1083.4569	905.0166	695.8494	465.7402	306.0967	321.6305	504.1895	765.3460	1020.3170	1234.6438
Space heating kWh	550.1397	426.9891	355.0574	184.5105	66.0626	0.0000	0.0000	0.0000	0.0000	191.6488	384.1607	562.4245
Space heating requirement - total per year (kWh/year)												
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar heating contribution - total per year (kWh/year)												
Space heating kWh	550.1397	426.9891	355.0574	184.5105	66.0626	0.0000	0.0000	0.0000	0.0000	191.6488	384.1607	562.4245
Space heating requirement after solar contribution - total per year (kWh/year)												
Space heating per m2												
(98c) / (4) =												

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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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	756.2711	595.3624	610.5461	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8721	0.9361	0.9096	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	659.5540	557.3016	555.3360	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	783.7617	750.9953	701.3700	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	89.4295	144.1081	108.6493	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	22.3574	36.0270	27.1623	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												85.5467 (107)
Energy for space heating												34.8042 (99)
Energy for space cooling												1.0942 (108)
Total												35.8984 (109)
Fabric Energy Efficiency (TFEE)												35.9 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	78.1800 (1b)	x 2.3900 (2b)	= 186.8502 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	186.8502 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1606 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4106 (18)
Number of sides sheltered	4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2874 (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	0.3664	0.3592	0.3521	0.3161	0.3089	0.2730	0.2730	0.2658	0.2874	0.3089	0.3233	0.3377 (22b)
Effective ac	0.5671	0.5645	0.5620	0.5500	0.5477	0.5373	0.5373	0.5353	0.5413	0.5477	0.5523	0.5570 (25)

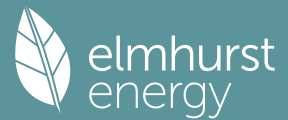
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Opening Type 1			1.8900	1.4000	2.6460		(26)
Opening Type 2			9.2100	1.1450	10.5458		(27)
Heatloss Floor 1			78.1800	0.1000	7.8180	75.0000	5863.5000 (28a)
External Wall 1	85.9200	9.2100	76.7100	0.1800	13.8078	60.0000	4602.6000 (29a)
External Wall 2	13.0700	1.8900	11.1800	0.1700	1.9006	190.0000	2124.2000 (29a)
Total net area of external elements Aum(A, m ²)			177.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.7182		(33)
Main dwelling							
Party Ceiling 1			78.1800			100.0000	7818.0000 (32b)
Internal Wall 1			149.1400			9.0000	1342.2600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 21750.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							278.2113 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.4400	0.0500	0.3220	
E3 Sill				5.5400	0.0240	0.1330	
E4 Jamb				16.4000	0.0190	0.3116	
E5 Ground floor (normal)				41.4200	0.0310	1.2840	

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)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.6236	81.8013	81.9761	82.8076	82.9650	83.7059	83.7059	83.8445	83.4190	82.9650	82.6472	82.3174
alpha	6.4416	6.4534	6.4651	6.5205	6.5310	6.5804	6.5804	6.5896	6.5613	6.5310	6.5098	6.4878
util living area	0.9921	0.9856	0.9656	0.9022	0.7625	0.5626	0.4070	0.4478	0.6935	0.9254	0.9836	0.9937 (86)
Living	20.2363	20.3572	20.5620	20.7989	20.9461	20.9936	20.9993	20.9988	20.9771	20.7917	20.4729	20.2087
Non living	19.2530	19.4069	19.6623	19.9476	20.0998	20.1445	20.1476	20.1487	20.1316	19.9472	19.5606	19.2233
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6093	20.3572	20.5620	20.7989	20.9461	20.9936	20.9993	20.9988	20.9771	20.7917	20.4729	20.3194 (87)
Th 2	20.1279	20.1296	20.1313	20.1393	20.1408	20.1478	20.1478	20.1491	20.1451	20.1408	20.1378	20.1346 (88)
util rest of house	0.9894	0.9810	0.9545	0.8734	0.7076	0.4906	0.3285	0.3657	0.6181	0.8965	0.9774	0.9915 (89)
MIT 2	19.7791	19.4069	19.6623	19.9476	20.0998	20.1445	20.1476	20.1487	20.1316	19.9472	19.5606	19.3876 (90)
Living area fraction									fLA = Living area /	(4) =		0.3694 (91)
MIT	20.0858	19.7579	19.9947	20.2621	20.4124	20.4582	20.4622	20.4627	20.4439	20.2592	19.8976	19.7318 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0858	19.7579	19.9947	20.2621	20.4124	20.4582	20.4622	20.4627	20.4439	20.2592	19.8976	19.7318 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9893	0.9785	0.9525	0.8779	0.7257	0.5171	0.3575	0.3960	0.6453	0.9010	0.9752	0.9903 (94)
Useful gains	648.2528	691.0082	722.7951	709.3036	605.3224	420.0556	278.5656	292.3601	448.7256	582.2301	607.2791	624.5408 (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	1168.4714	1097.4031	994.5856	829.0017	634.4699	422.8372	278.7726	292.7588	459.4746	703.4160	935.5545	1139.9801 (97)
Space heating kWh	387.0426	273.0974	202.2121	86.1826	21.6857	0.0000	0.0000	0.0000	0.0000	90.1623	236.3583	383.4869 (98a)
Space heating requirement - total per year (kWh/year)												1680.2280
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	387.0426	273.0974	202.2121	86.1826	21.6857	0.0000	0.0000	0.0000	0.0000	90.1623	236.3583	383.4869 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1680.2280
Space heating per m2										(98c) / (4) =		21.4918 (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 %)												217.7941 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	387.0426	273.0974	202.2121	86.1826	21.6857	0.0000	0.0000	0.0000	0.0000	90.1623	236.3583	383.4869 (98)
Space heating efficiency (main heating system 1)	217.7941	217.7941	217.7941	217.7941	217.7941	0.0000	0.0000	0.0000	0.0000	217.7941	217.7941	217.7941 (210)
Space heating fuel (main heating system)	177.7103	125.3924	92.8455	39.5707	9.9570	0.0000	0.0000	0.0000	0.0000	41.3980	108.5237	176.0777 (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	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449 (64)
Efficiency of water heater (217)m	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819 (216)
Fuel for water heating, kWh/month	149.5153	132.2794	140.5514	123.5016	119.6965	107.8221	106.3304	110.5322	111.7341	124.6465	132.6235	147.8617 (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	22.2651	17.8619	16.0827	11.7829	9.1014	7.4359	8.3026	10.7921	14.0178	18.3921	20.7739	22.8840 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-24.9743	-37.9071	-58.2211	-68.8899	-76.9723	-72.6585	-71.6712	-65.8571	-55.8148	-44.2071	-28.1674	-21.2643 (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	-6.3297	-14.3304	-30.7453	-50.3427	-70.3294	-72.1626	-71.2360	-59.0017	-41.9746	-22.5715	-8.9637	-4.9318 (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												771.4753 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.6819
Water heating fuel used												1507.0949 (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)												179.6924 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1079.5246 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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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	1378.7380 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	771.4753	16.4900	127.2163 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1507.0949	16.4900	248.5199 (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	179.6924	16.4900	29.6313 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-626.6051	16.4900	-103.3272
PV Unit electricity exported	-452.9195	5.5900	-25.3182
Total			-128.6454 (252)
Total energy cost			276.7221 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.8087 (257)
SAP value	86.8904
SAP rating (Section 12)	87 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	771.4753	0.1567	120.9257 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1507.0949	0.1409	212.3328 (264)
Space and water heating			333.2585 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	179.6924	0.1443	25.9352 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-626.6051	0.1335	-83.6468
PV Unit electricity exported	-452.9195	0.1237	-56.0274
Total			-139.6742 (269)
Total CO2, kg/year			219.5195 (272)
CO2 emissions per m2			2.8100 (273)
EI value			97.6120
EI rating			98 (274)
EI band			A

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

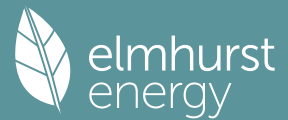
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	78.1800 (1b)	2.3900 (2b)	186.8502 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 186.8502 (5)
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1606 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4106 (18)
Number of sides sheltered	4 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.7000 \quad (20)$$
$$(21) = (18) \times (20) = 0.2874 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.4000	4.1000	4.1000	3.7000	3.7000	3.5000	3.8000	4.2000	4.0000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1000	1.0250	1.0250	0.9250	0.9250	0.8750	0.9500	1.0500	1.0000	1.0750	(22a)
Adj infilt rate													
Effective ac	0.3305	0.3161	0.3161	0.2946	0.2946	0.2658	0.2658	0.2515	0.2730	0.3018	0.2874	0.3089	(22b)
	0.5546	0.5500	0.5500	0.5434	0.5434	0.5353	0.5353	0.5316	0.5373	0.5455	0.5413	0.5477	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Opening Type 1			1.8900	1.4000	2.6460			(26)
Opening Type 2			9.2100	1.1450	10.5458			(27)
Heatloss Floor 1			78.1800	0.1000	7.8180	75.0000	5863.5000	(28a)
External Wall 1	85.9200	9.2100	76.7100	0.1800	13.8078	60.0000	4602.6000	(29a)
External Wall 2	13.0700	1.8900	11.1800	0.1700	1.9006	190.0000	2124.2000	(29a)
Total net area of external elements Aum(A, m2)			177.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.7182			(33)
Main dwelling								
Party Ceiling 1			78.1800			100.0000	7818.0000	(32b)
Internal Wall 1			149.1400			9.0000	1342.2600	(32c)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(34)
List of Thermal Bridges								(35)
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				6.4400	0.0500	0.3220		
E3 Sill				5.5400	0.0240	0.1330		
E4 Jamb				16.4000	0.0190	0.3116		
E5 Ground floor (normal)				41.4200	0.0310	1.2840		
E16 Corner (normal)				11.9500	0.0400	0.4780		
E17 Corner (inverted - internal area greater than external area)				2.3900	-0.0820	-0.1960		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.3326	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss							(33) + (36) + (36a) =	39.0508 (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	34.1978	33.9114	33.9114	33.5055	33.5055	33.0090	33.0090	32.7798	33.1284	33.6376	33.3766	33.7729	(38)
Average = Sum(39)m / 12 =													

Heat transfer coeff

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9369	0.9333	0.9333	0.9281	0.9281	0.9217	0.9217	0.9188	0.9232	0.9298	0.9264	0.9315	(40)
HLP (average)												0.9277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

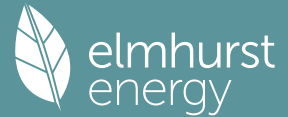
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4274 (42)
Hot water usage for mixer showers													
64.9196	63.9439	62.5223	59.8022	57.7948	55.5562	54.2838	55.6947	57.2413	59.6449	62.4234	64.6708		(42a)
Hot water usage for baths													
28.0408	27.6243	27.0379	25.9566	25.1469	24.2491	23.7642	24.3465	24.9806	25.9413	27.0448	27.9460		(42b)
Hot water usage for other uses													
39.4892	38.0532	36.6173	35.1813	33.7453	32.3094	32.3094	33.7453	35.1813	36.6173	38.0532	39.4892		(42c)
Average daily hot water use (litres/day)													121.7512 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
132.4495	129.6215	126.1774	120.9401	116.6871	112.1147	110.3574	113.7866	117.4032	122.2034	127.5215	132.1060		(44)
Energy conte	209.7677	184.5793	193.9300	165.5609	157.0832	137.8582	133.4677	140.8916	144.7699	165.8289	181.6777	206.8461	(45)
Energy content (annual)													2022.2613
Distribution loss (46)m = 0.15 x (45)m													
31.4652	27.6869	29.0895	24.8341	23.5625	20.6787	20.0202	21.1337	21.7155	24.8743	27.2517	31.0269		(46)
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364		(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364		(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													
264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449		(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	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449	(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	113.2668	100.6801	108.0008	97.1642	95.7492	87.9530	87.8970	90.3655	90.2512	98.6572	102.5230	112.2954	(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	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	(66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.4373	22.5932	18.3740	13.9103	10.3981	8.7785	9.4855	12.3296	16.5488	21.0125	24.5247	26.1443 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.7832	325.1223	316.7079	298.7945	276.1822	254.9297	240.7318	237.3927	245.8071	263.7205	286.3328	307.5853 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919 (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)	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968 (71)
Water heating gains (Table 5)	152.2403	149.8216	145.1623	134.9503	128.6952	122.1570	118.1412	121.4590	125.3489	132.6037	142.3931	150.9346 (72)
Total internal gains	600.0012	598.0775	580.7846	548.1955	515.8158	486.4056	468.8989	471.7217	488.2452	517.8771	553.7910	585.2046 (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			
East				2.7500	23.8018	0.6300	0.7000	0.7700	20.0039 (76)			
West				6.4600	23.8018	0.6300	0.7000	0.7700	46.9909 (80)			
Solar gains	66.9947	114.4714	184.9823	275.8874	327.1742	354.2060	333.8788	294.2049	229.5940	143.7916	80.2299	55.4106 (83)
Total gains	666.9959	712.5489	765.7669	824.0829	842.9900	840.6117	802.7777	765.9266	717.8392	661.6687	634.0209	640.6151 (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	82.4837	82.8076	82.8076	83.2708	83.2708	83.8445	83.8445	84.1120	83.7059	83.1194	83.4190	82.9650
alpha	6.4989	6.5205	6.5205	6.5514	6.5514	6.5896	6.5896	6.6075	6.5804	6.5413	6.5613	6.5310
util living area	0.9898	0.9824	0.9568	0.8729	0.7103	0.4781	0.3320	0.3561	0.6304	0.9009	0.9779	0.9917 (86)
Living	20.3033	20.4181	20.6228	20.8496	20.9671	20.9978	20.9998	20.9997	20.9877	20.8385	20.5416	20.2791
Non living	19.3444	19.4910	19.7428	20.0064	20.1206	20.1482	20.1490	20.1515	20.1413	19.9993	19.6519	19.3177
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6436	20.4181	20.6228	20.8496	20.9671	20.9978	20.9998	20.9997	20.9877	20.8385	20.5416	20.3800 (87)
Th 2	20.1362	20.1393	20.1393	20.1437	20.1437	20.1491	20.1491	20.1516	20.1478	20.1423	20.1451	20.1408 (88)
util rest of house	0.9865	0.9767	0.9430	0.8378	0.6502	0.4065	0.2557	0.2768	0.5525	0.8645	0.9695	0.9889 (89)
MIT 2	19.8206	19.4910	19.7428	20.0064	20.1206	20.1482	20.1490	20.1515	20.1413	19.9993	19.6519	19.4660 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.1246	19.8335	20.0679	20.3179	20.4333	20.4620	20.4633	20.4649	20.4540	20.3093	19.9805	19.8036 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.1246	19.8335	20.0679	20.3179	20.4333	20.4620	20.4633	20.4649	20.4540	20.3093	19.9805	19.8036 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9864	0.9741	0.9416	0.8455	0.6712	0.4329	0.2839	0.3061	0.5811	0.8724	0.9675	0.9876 (94)
Ext temp.	657.9298	694.1257	721.0773	696.7806	565.7787	363.9247	227.9084	234.4511	417.1231	577.2311	613.4174	632.6425 (95)
Heat loss rate W	4.7000	5.3000	7.0000	9.5000	12.4000	15.4000	17.3000	17.2000	14.6000	11.1000	7.6000	4.7000 (96)
Space heating kWh	1129.8301	1060.3945	953.4605	784.9044	582.8660	364.7688	227.9492	234.5164	422.5359	669.4100	896.6901	1099.9035 (97)
Space heating requirement - total per year (kWh/year)	351.0939	246.1326	172.8931	63.4491	12.7130	0.0000	0.0000	0.0000	0.0000	68.5811	203.9563	347.6422 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	351.0939	246.1326	172.8931	63.4491	12.7130	0.0000	0.0000	0.0000	0.0000	68.5811	203.9563	347.6422 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	(98c) / (4) =											1466.4614 (99)
Space heating per m2	18.7575 (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 %)	217.7387 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	351.0939	246.1326	172.8931	63.4491	12.7130	0.0000	0.0000	0.0000	0.0000	68.5811	203.9563	347.6422 (98)
Space heating fuel (main heating system)	217.7387	217.7387	217.7387	217.7387	217.7387	0.0000	0.0000	0.0000	0.0000	217.7387	217.7387	217.7387 (210)
Space heating efficiency (main heating system 2)	161.2455	113.0403	79.4040	29.1400	5.8386	0.0000	0.0000	0.0000	0.0000	31.4970	93.6702	159.6603 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449 (64)
Efficiency of water heater (217)m	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000 (216)
	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000 (217)

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Fuel for water heating, kWh/month	149.5000	132.2658	140.5370	123.4889	119.6842	107.8111	106.3195	110.5209	111.7227	124.6337	132.6099	147.8466	(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	22.2651	17.8619	16.0827	11.7829	9.1014	7.4359	8.3026	10.7921	14.0178	18.3921	20.7739	22.8840	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.0836	-39.1401	-59.1268	-71.0507	-77.8901	-76.5087	-74.9716	-70.0871	-59.6460	-47.5903	-31.5178	-24.9291	(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	-8.2911	-15.4105	-32.3132	-54.7573	-72.9279	-80.4802	-78.3373	-67.0237	-47.7804	-26.3067	-11.0740	-6.5192	(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												673.4959	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.7000	
Water heating fuel used												1506.9402	(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)												179.6924	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1162.7634	(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												1197.3651	(238)

10a. Fuel costs - using BEDF prices (597)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	673.4959	27.6700	186.3563	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1506.9402	27.6700	416.9703	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	179.6924	27.6700	49.7209	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-661.5418	27.6700	-183.0486	
PV Unit electricity exported	-501.2217	5.8100	-29.1210	
Total			-212.1696	(252)
Total energy cost			440.8780	(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	673.4959	0.1573	105.9084	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1506.9402	0.1409	212.3110	(264)
Space and water heating			318.2194	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	179.6924	0.1443	25.9352	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-661.5418	0.1337	-88.4155	
PV Unit electricity exported	-501.2217	0.1237	-62.0065	
Total			-150.4221	(269)
Total CO2, kg/year			193.7325	(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	673.4959	1.5821	1065.5650	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1506.9402	1.5210	2291.9884	(278)
Space and water heating			3357.5534	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	179.6924	1.5338	275.6182	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-661.5418	1.4939	-988.2688	
PV Unit electricity exported	-501.2217	0.4539	-227.5226	
Total			-1215.7914	(283)
Total Primary energy kWh/year			2417.3802	(286)

SAP 10 EPC IMPROVEMENTS

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01 ashp + PV

Current energy efficiency rating: B 87
Current environmental impact rating: A 98

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

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

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

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 597 TEST (31 Jul 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£653	£653	£0
Space heating	£186	£186	£0
Water heating	£417	£417	£0
Lighting	£50	£50	£0
Generated (PV)	-£212	-£212	£0
Total cost of fuels	£441	£441	£0
Total cost of uses	£441	£441	£0
Delivered energy	15 kWh/m²	15 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	31 kWh/m²	31 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

Main dwelling	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	78.1800 (1b)	2.3900 (2b)	186.8502 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800		186.8502 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 186.8502 (5)

2. Ventilation rate

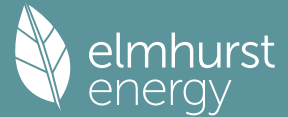
	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1606 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4106 (18)
Number of sides sheltered	4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2874 (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	0.3664	0.3592	0.3521	0.3161	0.3089	0.2730	0.2730	0.2658	0.2874	0.3089	0.3233	0.3377 (22b)
Effective ac	0.5671	0.5645	0.5620	0.5500	0.5477	0.5373	0.5373	0.5353	0.5413	0.5477	0.5523	0.5570 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Opening Type 1			1.8900	1.4000	2.6460			(26)
Opening Type 2			9.2100	1.1450	10.5458			(27)
Heatloss Floor 1			78.1800	0.1000	7.8180	75.0000	5863.5000	(28a)
External Wall 1	85.9200	9.2100	76.7100	0.1800	13.8078	60.0000	4602.6000	(29a)
External Wall 2	13.0700	1.8900	11.1800	0.1700	1.9006	190.0000	2124.2000	(29a)
Total net area of external elements Aum(A, m2)			177.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.7182			(33)
Main dwelling								
Party Ceiling 1			78.1800			100.0000	7818.0000	(32b)
Internal Wall 1			149.1400			9.0000	1342.2600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21750.5600 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 278.2113 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	6.4400	0.0500	0.3220	
E2 Other lintels (including other steel lintels)	5.5400	0.0240	0.1330	
E3 Sill	16.4000	0.0190	0.3116	
E4 Jamb	41.4200	0.0310	1.2840	
E5 Ground floor (normal)	11.9500	0.0400	0.4780	
E16 Corner (normal)	2.3900	-0.0820	-0.1960	
E17 Corner (inverted - internal area greater than external area)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.3326 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	39.0508 (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	34.9697	34.8090	34.6514	33.9114	33.7729	33.1284	33.1284	33.0090	33.3766	33.7729	34.0530	34.3458	(38)
Heat transfer coeff	74.0205	73.8598	73.7022	72.9622	72.8237	72.1792	72.1792	72.0598	72.4274	72.8237	73.1038	73.3966	(39)
Average = Sum(39)m / 12 =												72.9615	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9468	0.9447	0.9427	0.9333	0.9315	0.9232	0.9232	0.9217	0.9264	0.9315	0.9351	0.9388	(40)
HLP (average)												0.9333	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

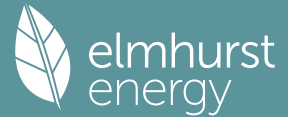
Assumed occupancy													2.4274 (42)
Hot water usage for mixer showers													
64.9196	63.9439	62.5223	59.8022	57.7948	55.5562	54.2838	55.6947	57.2413	59.6449	62.4234	64.6708	64.6708	(42a)
Hot water usage for baths													
28.0408	27.6243	27.0379	25.9566	25.1469	24.2491	23.7642	24.3465	24.9806	25.9413	27.0448	27.9460	27.9460	(42b)
Hot water usage for other uses													
39.4892	38.0532	36.6173	35.1813	33.7453	32.3094	32.3094	33.7453	35.1813	36.6173	38.0532	39.4892	39.4892	(42c)
Average daily hot water use (litres/day)													121.7512 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.4495	129.6215	126.1774	120.9401	116.6871	112.1147	110.3574	113.7866	117.4032	122.2034	127.5215	132.1060	(44)
Energy conte	209.7677	184.5793	193.9300	165.5609	157.0832	137.8582	133.4677	140.8916	144.7699	165.8289	181.6777	206.8461	(45)
Energy content (annual)													Total = Sum(45)m = 2022.2613
Distribution loss (46)m = 0.15 x (45)m													
31.4652	27.6869	29.0895	24.8341	23.5625	20.6787	20.0202	21.1337	21.7155	24.8743	27.2517	31.0269	31.0269	(46)
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449	261.2449	(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	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449	(64)
Electric shower(s)													Total per year (kWh/year) = Sum(64)m = 2662.7633 (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	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													
113.2668	100.6801	108.0008	97.1642	95.7492	87.9530	87.8970	90.3655	90.2512	98.6572	102.5230	112.2954	112.2954	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
25.4373	22.5932	18.3740	13.9103	10.3981	8.7785	9.4855	12.3296	16.5488	21.0125	24.5247	26.1443	26.1443	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
321.7832	325.1223	316.7079	298.7945	276.1822	254.9297	240.7318	237.3927	245.8071	263.7205	286.3328	307.5853	307.5853	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	(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)													
-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	(71)
Water heating gains (Table 5)													
152.2403	149.8216	145.1623	134.9503	128.6952	122.1570	118.1412	121.4590	125.3489	132.6037	142.3931	150.9346	150.9346	(72)
Total internal gains	600.0012	598.0775	580.7846	548.1955	515.8158	486.4056	468.8989	471.7217	488.2452	517.8771	553.7910	585.2046	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East	2.7500				19.6403	0.6300	0.7000	0.7700	16.5064 (76)			
West	6.4600				19.6403	0.6300	0.7000	0.7700	38.7750 (80)			
Solar gains	55.2814	108.1421	178.0946	259.7404	318.3216	325.8588	310.2308	266.4837	207.1314	128.3197	68.9294	45.4607 (83)
Total gains	655.2826	706.2196	758.8792	807.9359	834.1374	812.2644	779.1297	738.2054	695.3766	646.1967	622.7204	630.6653 (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	81.6236	81.8013	81.9761	82.8076	82.9650	83.7059	83.7059	83.8445	83.4190	82.9650	82.6472	82.3174
alpha	6.4416	6.4534	6.4651	6.5205	6.5310	6.5804	6.5804	6.5896	6.5613	6.5310	6.5098	6.4878
util living area	0.9921	0.9856	0.9656	0.9022	0.7625	0.5626	0.4070	0.4478	0.6935	0.9254	0.9836	0.9937 (86)
Living	20.2363	20.3572	20.5620	20.7989	20.9461	20.9936	20.9993	20.9988	20.9771	20.7917	20.4729	20.2087
Non living	19.2530	19.4069	19.6623	19.9476	20.0998	20.1445	20.1476	20.1487	20.1316	19.9472	19.5606	19.2233
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6093	20.3572	20.5620	20.7989	20.9461	20.9936	20.9993	20.9988	20.9771	20.7917	20.4729	20.3194 (87)
Th 2	20.1279	20.1296	20.1313	20.1393	20.1408	20.1478	20.1478	20.1491	20.1451	20.1408	20.1378	20.1346 (88)
util rest of house	0.9894	0.9810	0.9545	0.8734	0.7076	0.4906	0.3285	0.3657	0.6181	0.8965	0.9774	0.9915 (89)
MIT 2	19.7791	19.4069	19.6623	19.9476	20.0998	20.1445	20.1476	20.1487	20.1316	19.9472	19.5606	19.3876 (90)
Living area fraction									fLA = Living area / (4) =			0.3694 (91)
MIT	20.0858	19.7579	19.9947	20.2621	20.4124	20.4582	20.4622	20.4627	20.4439	20.2592	19.8976	19.7318 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0858	19.7579	19.9947	20.2621	20.4124	20.4582	20.4622	20.4627	20.4439	20.2592	19.8976	19.7318 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9893	0.9785	0.9525	0.8779	0.7257	0.5171	0.3575	0.3960	0.6453	0.9010	0.9752	0.9903 (94)
Useful gains	648.2528	691.0082	722.7951	709.3036	605.3224	420.0556	278.5656	292.3601	448.7256	582.2301	607.2791	624.5408 (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	1168.4714	1097.4031	994.5856	829.0017	634.4699	422.8372	278.7726	292.7588	459.4746	703.4160	935.5545	1139.9801 (97)
Space heating kWh	387.0426	273.0974	202.2121	86.1826	21.6857	0.0000	0.0000	0.0000	0.0000	90.1623	236.3583	383.4869 (98a)
Space heating requirement - total per year (kWh/year)												1680.2280
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	387.0426	273.0974	202.2121	86.1826	21.6857	0.0000	0.0000	0.0000	0.0000	90.1623	236.3583	383.4869 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1680.2280
Space heating per m2										(98c) / (4) =		21.4918 (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 %)												217.7941 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	387.0426	273.0974	202.2121	86.1826	21.6857	0.0000	0.0000	0.0000	0.0000	90.1623	236.3583	383.4869 (98)
Space heating efficiency (main heating system 1)	217.7941	217.7941	217.7941	217.7941	217.7941	0.0000	0.0000	0.0000	0.0000	217.7941	217.7941	217.7941 (210)
Space heating fuel (main heating system)	177.7103	125.3924	92.8455	39.5707	9.9570	0.0000	0.0000	0.0000	0.0000	41.3980	108.5237	176.0777 (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	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449 (64)
Efficiency of water heater	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819	176.6819 (216)
Fuel for water heating, kWh/month	149.5153	132.2794	140.5514	123.5016	119.6965	107.8221	106.3304	110.5322	111.7341	124.6465	132.6235	147.8617 (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	22.2651	17.8619	16.0827	11.7829	9.1014	7.4359	8.3026	10.7921	14.0178	18.3921	20.7739	22.8840 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-24.9743	-37.9071	-58.2211	-68.8899	-76.9723	-72.6585	-71.6712	-65.8571	-55.8148	-44.2071	-28.1674	-21.2643 (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	-6.3297	-14.3304	-30.7453	-50.3427	-70.3294	-72.1626	-71.2360	-59.0017	-41.9746	-22.5715	-8.9637	-4.9318 (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)

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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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													771.4753	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													176.6819	
Water heating fuel used													1507.0949	(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)													179.6924	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1079.5246	(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													1378.7380	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	771.4753	16.4900	127.2163	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1507.0949	16.4900	248.5199	(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	179.6924	16.4900	29.6313	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-626.6051	16.4900	-103.3272	
PV Unit electricity exported	-452.9195	5.5900	-25.3182	
Total			-128.6454	(252)
Total energy cost			276.7221	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.8087	(257)
SAP value		86.8904	
SAP rating (Section 12)		87	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	771.4753	0.1567	120.9257	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1507.0949	0.1409	212.3328	(264)
Space and water heating			333.2585	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	179.6924	0.1443	25.9352	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-626.6051	0.1335	-83.6468	
PV Unit electricity exported	-452.9195	0.1237	-56.0274	
Total			-139.6742	(269)
Total CO2, kg/year			219.5195	(272)
CO2 emissions per m2			2.8100	(273)
EI value			97.6120	
EI rating			98	(274)
EI band			A	

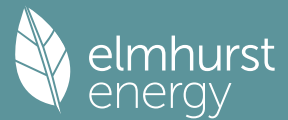
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	78.1800	2.3900	186.8502	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800			
Dwelling volume			186.8502	(5)

2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1606	(8)
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		5.0000		(17)
Infiltration rate		0.4106		(18)
Number of sides sheltered		4		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000		(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2874		(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.6000	4.4000	4.4000	4.1000	4.1000	3.7000	3.7000	3.5000	3.8000	4.2000	4.0000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1000	1.0250	1.0250	0.9250	0.9250	0.8750	0.9500	1.0500	1.0000	1.0750	(22a)
Adj infilt rate													
	0.3305	0.3161	0.3161	0.2946	0.2946	0.2658	0.2658	0.2515	0.2730	0.3018	0.2874	0.3089	(22b)
Effective ac	0.5546	0.5500	0.5500	0.5434	0.5434	0.5353	0.5353	0.5316	0.5373	0.5455	0.5413	0.5477	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Opening Type 1			1.8900	1.4000	2.6460			(26)
Opening Type 2			9.2100	1.1450	10.5458			(27)
Heatloss Floor 1			78.1800	0.1000	7.8180	75.0000	5863.5000	(28a)
External Wall 1	85.9200	9.2100	76.7100	0.1800	13.8078	60.0000	4602.6000	(29a)
External Wall 2	13.0700	1.8900	11.1800	0.1700	1.9006	190.0000	2124.2000	(29a)
Total net area of external elements Aum(A, m2)			177.1700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.7182		(33)
Main dwelling								
Party Ceiling 1			78.1800			100.0000	7818.0000	(32b)
Internal Wall 1			149.1400			9.0000	1342.2600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	21750.5600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		278.2113	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.4400	0.0500	0.3220
E3 Sill	5.5400	0.0240	0.1330
E4 Jamb	16.4000	0.0190	0.3116
E5 Ground floor (normal)	41.4200	0.0310	1.2840
E16 Corner (normal)	11.9500	0.0400	0.4780
E17 Corner (inverted - internal area greater than external area)	2.3900	-0.0820	-0.1960

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		2.3326	(36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.0508	(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	34.1978	33.9114	33.9114	33.5055	33.5055	33.0090	33.0090	32.7798	33.1284	33.6376	33.3766	33.7729	(38)
Average = Sum(39)m / 12 =	73.2486	72.9622	72.9622	72.5564	72.5564	72.0598	72.0598	71.8306	72.1792	72.6884	72.4274	72.8237	(39)
													72.5296

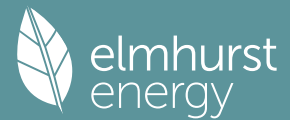
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9369	0.9333	0.9333	0.9281	0.9281	0.9217	0.9217	0.9188	0.9232	0.9298	0.9264	0.9315	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4274	(42)
Hot water usage for mixer showers														
	64.9196	63.9439	62.5223	59.8022	57.7948	55.5562	54.2838	55.6947	57.2413	59.6449	62.4234	64.6708	(42a)	
Hot water usage for baths														
	28.0408	27.6243	27.0379	25.9566	25.1469	24.2491	23.7642	24.3465	24.9806	25.9413	27.0448	27.9460	(42b)	
Hot water usage for other uses														
	39.4892	38.0532	36.6173	35.1813	33.7453	32.3094	32.3094	33.7453	35.1813	36.6173	38.0532	39.4892	(42c)	
Average daily hot water use (litres/day)													121.7512	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	132.4495	129.6215	126.1774	120.9401	116.6871	112.1147	110.3574	113.7866	117.4032	122.2034	127.5215	132.1060	(44)
Energy conte	209.7677	184.5793	193.9300	165.5609	157.0832	137.8582	133.4677	140.8916	144.7699	165.8289	181.6777	206.8461	(45)
Energy content (annual)										Total = Sum(45)m =		2022.2613	
Distribution loss (46)m = 0.15 x (45)m													
	31.4652	27.6869	29.0895	24.8341	23.5625	20.6787	20.0202	21.1337	21.7155	24.8743	27.2517	31.0269	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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													
	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449	(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)

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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	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449	(64)
Total per year (kWh/year) = Sum(64)m =													2662.7633 (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	113.2668	100.6801	108.0008	97.1642	95.7492	87.9530	87.8970	90.3655	90.2512	98.6572	102.5230	112.2954	(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	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	145.6452	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.4373	22.5932	18.3740	13.9103	10.3981	8.7785	9.4855	12.3296	16.5488	21.0125	24.5247	26.1443	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.7832	325.1223	316.7079	298.7945	276.1822	254.9297	240.7318	237.3927	245.8071	263.7205	286.3328	307.5853	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	51.9919	(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)	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	-97.0968	(71)
Water heating gains (Table 5)	152.2403	149.8216	145.1623	134.9503	128.6952	122.1570	118.1412	121.4590	125.3489	132.6037	142.3931	150.9346	(72)
Total internal gains	600.0012	598.0775	580.7846	548.1955	515.8158	486.4056	468.8989	471.7217	488.2452	517.8771	553.7910	585.2046	(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
East					2.7500	23.8018	0.6300	0.7000			0.7700	20.0039 (76)
West					6.4600	23.8018	0.6300	0.7000			0.7700	46.9909 (80)
Solar gains	66.9947	114.4714	184.9823	275.8874	327.1742	354.2060	333.8788	294.2049	229.5940	143.7916	80.2299	55.4106 (83)
Total gains	666.9959	712.5489	765.7669	824.0829	842.9900	840.6117	802.7777	765.9266	717.8392	661.6687	634.0209	640.6151 (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	82.4837	82.8076	82.8076	83.2708	83.2708	83.8445	83.8445	84.1120	83.7059	83.1194	83.4190	82.9650	
alpha	6.4989	6.5205	6.5205	6.5514	6.5514	6.5896	6.5896	6.6075	6.5804	6.5413	6.5613	6.5310	
util living area	0.9898	0.9824	0.9568	0.8729	0.7103	0.4781	0.3320	0.3561	0.6304	0.9009	0.9779	0.9917	(86)
Living	20.3033	20.4181	20.6228	20.8496	20.9671	20.9978	20.9998	20.9997	20.9877	20.8385	20.5416	20.2791	
Non living	19.3444	19.4910	19.7428	20.0064	20.1206	20.1482	20.1490	20.1515	20.1413	19.9993	19.6519	19.3177	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6436	20.4181	20.6228	20.8496	20.9671	20.9978	20.9998	20.9997	20.9877	20.8385	20.5416	20.2791	(87)
Th 2	20.1362	20.1393	20.1393	20.1437	20.1437	20.1491	20.1491	20.1516	20.1478	20.1423	20.1451	20.1408	(88)
util rest of house	0.9865	0.9767	0.9430	0.8378	0.6502	0.4065	0.2557	0.2768	0.5525	0.8645	0.9695	0.9889	(89)
MIT 2	19.8206	19.4910	19.7428	20.0064	20.1206	20.1482	20.1490	20.1515	20.1413	19.9993	19.6519	19.4660	(90)
Living area fraction													(91)
MIT	20.1246	19.8335	20.0679	20.3179	20.4333	20.4620	20.4633	20.4649	20.4540	20.3093	19.9805	19.8036	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1246	19.8335	20.0679	20.3179	20.4333	20.4620	20.4633	20.4649	20.4540	20.3093	19.9805	19.8036	(93)

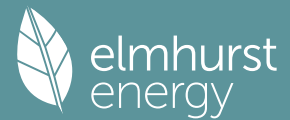
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9864	0.9741	0.9416	0.8455	0.6712	0.4329	0.2839	0.3061	0.5811	0.8724	0.9675	0.9876	(94)
Ext temp.	657.9298	694.1257	721.0773	696.7806	565.7787	363.9247	227.9084	234.4511	417.1231	577.2311	613.4174	632.6425	(95)
Heat loss rate W	4.7000	5.3000	7.0000	9.5000	12.4000	15.4000	17.3000	17.2000	14.6000	11.1000	7.6000	4.7000	(96)
Space heating kWh	1129.8301	1060.3945	953.4605	784.9044	582.8660	364.7688	227.9492	234.5164	422.5359	669.4100	896.6901	1099.9035	(97)
Space heating requirement - total per year (kWh/year)	351.0939	246.1326	172.8931	63.4491	12.7130	0.0000	0.0000	0.0000	0.0000	68.5811	203.9563	347.6422	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	351.0939	246.1326	172.8931	63.4491	12.7130	0.0000	0.0000	0.0000	0.0000	68.5811	203.9563	347.6422	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1466.4614	(98c)
Space heating per m2												18.7575	(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 %)	217.7387	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.0939	246.1326	172.8931	63.4491	12.7130	0.0000	0.0000	0.0000	0.0000	68.5811	203.9563	347.6422	(98)
Space heating efficiency (main heating system 1)	217.7387	217.7387	217.7387	217.7387	217.7387	0.0000	0.0000	0.0000	0.0000	217.7387	217.7387	217.7387	(210)
Space heating fuel (main heating system)	161.2455	113.0403	79.4040	29.1400	5.8386	0.0000	0.0000	0.0000	0.0000	31.4970	93.6702	159.6603	(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	264.1665	233.7137	248.3288	218.2049	211.4820	190.5022	187.8665	195.2904	197.4139	220.2277	234.3217	261.2449	(64)
Efficiency of water heater	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	176.7000	(216)
Fuel for water heating, kWh/month	149.5000	132.2658	140.5370	123.4889	119.6842	107.8111	106.3195	110.5209	111.7227	124.6337	132.6099	147.8466	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	22.2651	17.8619	16.0827	11.7829	9.1014	7.4359	8.3026	10.7921	14.0178	18.3921	20.7739	22.8840	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-29.0836	-39.1401	-59.1268	-71.0507	-77.8901	-76.5087	-74.9716	-70.0871	-59.6460	-47.5903	-31.5178	-24.9291	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-8.2911	-15.4105	-32.3132	-54.7573	-72.9279	-80.4802	-78.3373	-67.0237	-47.7804	-26.3067	-11.0740	-6.5192	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												673.4959	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.7000	
Water heating fuel used												1506.9402	(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)												179.6924	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1162.7634	(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												1197.3651	(238)

10a. Fuel costs - using BEDF prices (597)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	673.4959	27.6700	186.3563	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1506.9402	27.6700	416.9703	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	179.6924	27.6700	49.7209	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-661.5418	27.6700	-183.0486	
PV Unit electricity exported	-501.2217	5.8100	-29.1210	
Total			-212.1696	(252)
Total energy cost			440.8780	(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	673.4959	0.1573	105.9084	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1506.9402	0.1409	212.3110	(264)
Space and water heating			318.2194	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	179.6924	0.1443	25.9352	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-661.5418	0.1337	-88.4155	
PV Unit electricity exported	-501.2217	0.1237	-62.0065	
Total			-150.4221	(269)
Total CO2, kg/year			193.7325	(272)

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

Energy Primary energy factor Primary energy

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Space heating - main system 1	kWh/year	kg CO2/kWh	kWh/year
Total CO2 associated with community systems	673.4959	1.5821	1065.5650 (275)
Water heating (other fuel)			0.0000 (473)
Space and water heating	1506.9402	1.5210	2291.9884 (278)
Pumps, fans and electric keep-hot	0.0000	0.0000	3357.5534 (279)
Energy for lighting	179.6924	1.5338	0.0000 (281)
			275.6182 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-661.5418	1.4939	-988.2688
PV Unit electricity exported	-501.2217	0.4539	-227.5226
Total			-1215.7914 (283)
Total Primary energy kWh/year			2417.3802 (286)