

Full SAP Calculation Printout



Plot Reference	03			Issued on Date	05/08/2026
Assessment Reference	03 ashp + PV	Plot Type Ref			
Plot Address	Flat 3, 2-4 Church St, Caversham, Reading, RG4 8AT			SAP Version	10.2
SAP Rating	86 B	DER	3.13	TER	10.95
Environmental	97 A	% DER < TER			71.42
CO ₂ Emissions (t/year)	0.21	DFEE	33.53	TFEE	35.04
Compliance Check	See BREL	% DFEE < TFEE			4.32
% DPER < TPER	35.06	DPER	37.05	TPER	57.06
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			7.9600	1.1450	9.1145		(27)
Opening Type 3			5.3200	1.1450	6.0916		(27a)
External Wall 1	74.8000	7.9600	66.8400	0.1600	10.6944	60.0000	4010.4000 (29a)
External Wall 2	14.8600	1.8900	12.9700	0.1700	2.2049	190.0000	2464.3000 (29a)
External Roof 1	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000 (30)
External Roof 2	33.1800	5.3200	27.8600	0.1200	3.3432	9.0000	250.7400 (30)
Total net area of external elements A _{um} (A, m ²)			167.8400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.0446		(33)
Main dwelling							
Party Floor 1			78.1800			80.0000	6254.4000 (32d)
Internal Wall 1			177.8200			9.0000	1600.3800 (32c)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 14985.2200	(34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							191.6759 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				10.9300	0.0400	0.4372	
E17 Corner (inverted - internal area greater than external area)				2.0900	-0.0820	-0.1714	
E2 Other lintels (including other steel lintels)				5.7800	0.0500	0.2890	

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E3 Sill	4.8800	0.0240	0.1171
E4 Jamb	16.6000	0.0190	0.3154
E7 Party floor between dwellings (in blocks of flats)	41.4200	0.0320	1.3254
R1 Head of roof window	5.6000	0.2400	1.3440
R2 Sill of roof window	5.6000	0.2400	1.3440
R3 Jamb of roof window	13.3000	0.2400	3.1920
E11 Eaves (insulation at rafter level)	28.8000	0.0200	0.5760
E12 Gable (insulation at ceiling level)	7.7700	0.0450	0.3496
E13 Gable (insulation at rafter level)	6.3200	0.0550	0.3476

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

Point Thermal Bridges

Total fabric heat loss

$$(33) + (36) + (36a) = 48.5106 \quad (37)$$

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
Average = Sum(39)m / 12 =	83.4803	83.3196	83.1620	82.4220	82.2836	81.6390	81.6390	81.5196	81.8873	82.2836	82.5637	82.8565

HLP (average)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Days in mont	1.0678	1.0657	1.0637	1.0543	1.0525	1.0442	1.0442	1.0427	1.0474	1.0525	1.0561	1.0598

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											
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 (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
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
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											
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)	31.1364 28.1232 31.1364 30.1320 31.1364 30.1320 31.1364 31.1364 30.1320 31.1364 30.1320 31.1364											
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											
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											
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											
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											
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											
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											
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											
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											
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											
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											
12Total per year (kWh/year)	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											
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											

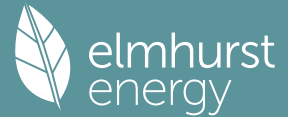
5. Internal gains (see Table 5 and 5a)

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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.7055	122.5668	110.7055	114.3957	110.7055	114.3957	110.7055	110.7055	114.3957	110.7055	114.3957	110.7055
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)	152.2403	149.8216	145.1623	134.9503	128.6952	122.1570	118.1412	121.4590	125.3489	132.6037	142.3931	150.9346
Total internal gains	537.9519	549.6317	527.4734	508.9496	483.8541	466.7669	449.5483	450.6289	463.8467	479.4132	508.0431	527.1336

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	5.8200	19.6403	0.6300	0.7000	0.7700	34.9335 (76)
West	2.1400	19.6403	0.6300	0.7000	0.7700	12.8450 (80)
North	3.8000	26.0000	0.6300	0.7000	1.0000	39.2137 (82)
South	1.5200	26.0000	0.6300	0.7000	1.0000	15.6855 (82)

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Solar gains	102.6777	207.4862	356.6280	541.2141	680.5278	703.9341	667.2007	561.8227	421.8425	250.2634	129.2539	83.6324 (83)
Total gains	640.6296	757.1179	884.1014	1050.1637	1164.3819	1170.7011	1116.7490	1012.4517	885.6892	729.6767	637.2970	610.7659 (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	49.8628	49.9590	50.0536	50.5030	50.5880	50.9874	50.9874	51.0621	50.8328	50.5880	50.4164	50.2382
alpha	4.3242	4.3306	4.3369	4.3669	4.3725	4.3992	4.3992	4.4041	4.3889	4.3725	4.3611	4.3492
util living area	0.9810	0.9616	0.9142	0.7921	0.6171	0.4391	0.3202	0.3674	0.6027	0.8724	0.9643	0.9842 (86)
Living	19.6886	19.9489	20.3184	20.7157	20.9196	20.9855	20.9971	20.9949	20.9463	20.6233	20.0845	19.6430
Non living	18.5166	18.8438	19.2979	19.7630	19.9744	20.0380	20.0455	20.0458	20.0076	19.6759	19.0240	18.4638
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	20.3292	19.9489	20.3184	20.7157	20.9196	20.9855	20.9971	20.9949	20.9463	20.6233	20.0845	19.8329 (87)
Th 2	20.0272	20.0289	20.0306	20.0384	20.0398	20.0466	20.0466	20.0479	20.0440	20.0398	20.0369	20.0338 (88)
util rest of house	0.9765	0.9530	0.8960	0.7553	0.5639	0.3765	0.2515	0.2928	0.5309	0.8384	0.9547	0.9805 (89)
MIT 2	19.4250	18.8438	19.2979	19.7630	19.9744	20.0380	20.0455	20.0458	20.0076	19.6759	19.0240	18.7467 (90)
Living area fraction									fLA = Living area / (4) =			0.3694 (91)
MIT	19.7590	19.2520	19.6749	20.1149	20.3236	20.3880	20.3971	20.3964	20.3543	20.0259	19.4158	19.1479 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7590	19.2520	19.6749	20.1149	20.3236	20.3880	20.3971	20.3964	20.3543	20.0259	19.4158	19.1479 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9750	0.9445	0.8883	0.7584	0.5801	0.3991	0.2769	0.3203	0.5550	0.8378	0.9470	0.9760 (94)
Useful gains	624.6338	715.0643	785.3495	796.4307	675.4070	467.2792	309.1909	324.2815	491.5575	611.3383	603.5327	596.1298 (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	1290.5229	1195.8053	1095.6480	924.3569	709.5803	472.5252	309.9888	325.7827	512.1506	775.5978	1016.8334	1238.5318 (97)
Space heating kWh	495.4215	323.0580	230.8621	92.1069	25.4250	0.0000	0.0000	0.0000	0.0000	122.2090	297.5765	477.9470 (98a)
Space heating requirement - total per year (kWh/year)												2064.6060
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	495.4215	323.0580	230.8621	92.1069	25.4250	0.0000	0.0000	0.0000	0.0000	122.2090	297.5765	477.9470 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2064.6060
Space heating per m2										(98c) / (4) =		26.4084 (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 %)												218.9288 (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	495.4215	323.0580	230.8621	92.1069	25.4250	0.0000	0.0000	0.0000	0.0000	122.2090	297.5765	477.9470 (98)
Space heating efficiency (main heating system 1)	218.9288	218.9288	218.9288	218.9288	218.9288	0.0000	0.0000	0.0000	0.0000	218.9288	218.9288	218.9288 (210)
Space heating fuel (main heating system)	226.2934	147.5630	105.4507	42.0716	11.6133	0.0000	0.0000	0.0000	0.0000	55.8213	135.9238	218.3116 (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	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047 (216)
Fuel for water heating, kWh/month	149.8352	132.5624	140.8521	123.7658	119.9526	108.0528	106.5579	110.7687	111.9732	124.9132	132.9073	148.1781 (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	20.3382	16.3161	14.6908	10.7631	8.3137	6.7924	7.5841	9.8581	12.8046	16.8004	18.9760	20.9035 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-25.1863	-38.1550	-58.5059	-68.9725	-77.0516	-72.6249	-71.6313	-65.8094	-55.7660	-44.5073	-28.3722	-21.4123 (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	-6.1178	-14.0825	-30.4605	-50.2600	-70.2502	-72.1961	-71.2759	-59.0493	-42.0235	-22.2714	-8.7589	-4.7839 (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												943.0489 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.3047
Water heating fuel used												1510.3193 (219)

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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)	164.1409 (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	1537.9844 (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	943.0489	0.1568	147.8801 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1510.3193	0.1409	212.7871 (264)
Space and water heating			360.6671 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	164.1409	0.1443	23.6906 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-627.9946	0.1335	-83.8630
PV Unit electricity exported	-451.5301	0.1235	-55.7779
Total			-139.6409 (269)
Total CO2, kg/year			244.7168 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	943.0489	1.5805	1490.4717 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1510.3193	1.5210	2297.1280 (278)
Space and water heating			3787.5996 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	164.1409	1.5338	251.7647 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-627.9946	1.4935	-937.9045
PV Unit electricity exported	-451.5301	0.4533	-204.6961
Total			-1142.6006 (283)
Total Primary energy kWh/year			2896.7638 (286)
Dwelling Primary energy Rate (DPER)			37.0500 (287)

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

1. Overall dwelling characteristics

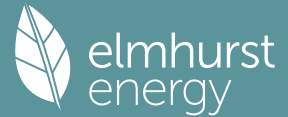
	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	78.1800 (1b)	2.3900 (2b)	186.8502 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	186.8502 (5)

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 = (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)

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Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3664	0.3592	0.3521	0.3161	0.3089	0.2730	0.2730	0.2658	0.2874	0.3089	0.3233	0.3377 (22b)
	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							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			7.9600	1.1450	9.1145		(27)
TER Roof Window			5.3200	1.1450	8.4682		(27a)
External Wall 1	74.8000	7.9600	66.8400	0.1800	12.0312		(29a)
External Wall 2	14.8600	1.8900	12.9700	0.1800	2.3346		(29a)
External Roof 1	45.0000		45.0000	0.1100	4.9500		(30)
External Roof 2	33.1800	5.3200	27.8600	0.1100	3.0646		(30)
Total net area of external elements Aum(A, m2)			167.8400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	41.8531	(33)

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

191.6759 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	10.9300	0.0900	0.9837
E17 Corner (inverted - internal area greater than external area)	2.0900	-0.0900	-0.1881
E2 Other lintels (including other steel lintels)	5.7800	0.0500	0.2890
E3 Sill	4.8800	0.0500	0.2440
E4 Jamb	16.6000	0.0500	0.8300
E7 Party floor between dwellings (in blocks of flats)	41.4200	0.0700	2.8994
R1 Head of roof window	5.6000	0.0800	0.4480
R2 Sill of roof window	5.6000	0.0600	0.3360
R3 Jamb of roof window	13.3000	0.0800	1.0640
E11 Eaves (insulation at rafter level)	28.8000	0.0400	1.1520
E12 Gable (insulation at ceiling level)	7.7700	0.0600	0.4662
E13 Gable (insulation at rafter level)	6.3200	0.0800	0.5056

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

9.0298 (36)

Point Thermal bridges

(33a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 50.8829 (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	85.8526	85.6918	85.5343	84.7942	84.6558	84.0112	84.0112	83.8919	84.2595	84.6558	84.9359	85.2287 (39)
Average = Sum(39)m / 12 =												84.7936

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0981	1.0961	1.0941	1.0846	1.0828	1.0746	1.0746	1.0731	1.0778	1.0828	1.0864	1.0902 (40)
HLP (average)												1.0846
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

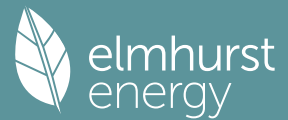
4. Water heating energy requirements (kWh/year)

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)
	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 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):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (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 (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 (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 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
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 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h												
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)												2295 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
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)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.7055	122.5668	110.7055	114.3957	110.7055	114.3957	110.7055	110.7055	114.3957	110.7055	114.3957	110.7055	(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	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	(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	(72)
Total internal gains	532.5606	544.2404	522.0821	503.5583	478.4628	458.3756	441.1571	442.2376	455.4554	474.0220	502.6518	521.7423	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East	5.8200	19.6403	0.6300	0.7000	0.7000	0.7700	34.9335 (76)
West	2.1400	19.6403	0.6300	0.7000	0.7000	0.7700	12.8450 (80)
North	3.8000	26.0000	0.6300	0.7000	0.7000	1.0000	39.2137 (82)
South	1.5200	26.0000	0.6300	0.7000	0.7000	1.0000	15.6855 (82)
Solar gains	102.6777	207.4862	356.6280	541.2141	680.5278	703.9341	83.6324 (83)
Total gains	635.2383	751.7267	878.7101	1044.7724	1158.9906	1162.3098	605.3746 (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	48.4850	48.5759	48.6654	49.0901	49.1704	49.5477	49.5477	49.6182	49.4017	49.1704	49.0083	48.8399
alpha	4.2323	4.2384	4.2444	4.2727	4.2780	4.3032	4.3032	4.3079	4.2934	4.2780	4.2672	4.2560
util living area	0.9820	0.9638	0.9192	0.8029	0.6314	0.4534	0.3315	0.3805	0.6196	0.8804	0.9665	0.9850 (86)
MIT	19.6223	19.8851	20.2636	20.6807	20.9053	20.9818	20.9963	20.9934	20.9354	20.5856	20.0281	19.5763 (87)
Th 2	20.0024	20.0040	20.0057	20.0134	20.0149	20.0216	20.0216	20.0229	20.0190	20.0149	20.0119	20.0089 (88)
util rest of house	0.9777	0.9555	0.9016	0.7664	0.5769	0.3876	0.2588	0.3015	0.5456	0.8472	0.9573	0.9814 (89)
MIT 2	18.4155	18.7462	19.2128	19.7032	19.9376	20.0108	20.0202	20.0202	19.9751	19.6131	18.9358	18.3619 (90)
Living area fraction	18.8613	19.1670	19.6010	20.0643	20.2951	20.3695	20.3808	20.3797	20.3298	19.9724	19.3393	18.8105 (92)
MIT	18.8613	19.1670	19.6010	20.0643	20.2951	20.3695	20.3808	20.3797	20.3298	19.9724	19.3393	18.8105 (93)
Temperature adjustment	18.8613	19.1670	19.6010	20.0643	20.2951	20.3695	20.3808	20.3797	20.3298	19.9724	19.3393	18.8105 (93)
adjusted MIT	18.8613	19.1670	19.6010	20.0643	20.2951	20.3695	20.3808	20.3797	20.3298	19.9724	19.3393	18.8105 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9711	0.9468	0.8933	0.7684	0.5929	0.4113	0.2856	0.3306	0.5700	0.8455	0.9495	0.9756 (94)
Ext temp.	616.9086	711.7452	784.9352	802.7977	687.1958	478.0813	316.5803	331.9160	500.0370	612.4169	599.9687	590.5943 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1250.1279	1222.5622	1120.5842	946.6710	727.6232	484.7003	317.6280	333.8626	524.9212	793.4262	1039.5572	1245.2335 (97)
Space heating requirement - total per year (kWh/year)	471.1152	343.2690	249.7229	103.5888	30.0780	0.0000	0.0000	0.0000	0.0000	134.6709	316.5037	487.0516 (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)	471.1152	343.2690	249.7229	103.5888	30.0780	0.0000	0.0000	0.0000	0.0000	134.6709	316.5037	487.0516 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	471.1152	343.2690	249.7229	103.5888	30.0780	0.0000	0.0000	0.0000	0.0000	134.6709	316.5037	487.0516 (98c)
Space heating per m2	(98c) / (4) = 27.3216 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.3000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	471.1152	343.2690	249.7229	103.5888	30.0780	0.0000	0.0000	0.0000	0.0000	134.6709	316.5037	487.0516 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	510.4173	371.9057	270.5556	112.2305	32.5872	0.0000	0.0000	0.0000	0.0000	145.9057	342.9076	527.6832 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating requirement	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	85.6615	85.2556	84.4170	82.7817	80.9612	79.8000	79.8000	79.8000	79.8000	83.2988	85.0659	85.7504 (217)
Fuel for water heating, kWh/month	264.6276	235.0781	252.3658	226.9751	225.3767	206.5163	204.3232	212.2747	214.3899	228.4377	237.0985	261.5871 (219)
Space cooling fuel requirement												

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(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	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.0024	18.4534	16.6152	12.1730	9.4028	7.6822	8.5776	11.1494	14.4820	19.0012	21.4618	23.6417	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-36.4773	-51.3785	-73.7894	-82.8997	-89.3408	-83.3728	-82.3365	-77.7479	-69.6507	-58.7087	-40.0830	-31.5419	(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	-20.7581	-43.6511	-86.7294	-130.2202	-172.1457	-172.9533	-170.9232	-144.7438	-106.1207	-62.4186	-27.7130	-16.4168	(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													2314.1930	(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													2769.0505	(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)													185.6427	(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													3422.7650	(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	2314.1930	0.2100	485.9805 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2769.0505	0.2100	581.5006 (264)
Space and water heating			1067.4811 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	185.6427	0.1443	26.7940 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-777.3273	0.1346	-104.6313
PV Unit electricity exported	-1154.7939	0.1259	-145.3942
Total			-250.0255 (269)
Total CO2, kg/year			856.1789 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9500 (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	2314.1930	1.1300	2615.0381 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2769.0505	1.1300	3129.0271 (278)
Space and water heating			5744.0652 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	185.6427	1.5338	284.7450 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-777.3273	1.4975	-1164.0276
PV Unit electricity exported	-1154.7939	0.4622	-533.6973
Total			-1697.7249 (283)
Total Primary energy kWh/year			4461.1861 (286)
Target Primary Energy Rate (TPER)			57.0600 (287)

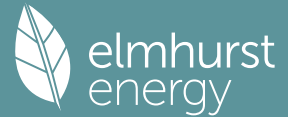
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	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

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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)
													Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											30.0000	/ (5) =	0.1606 (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	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
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)													
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													
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)	

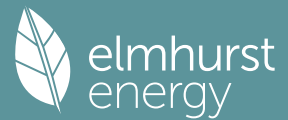
3. Heat losses and heat loss parameter

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			7.9600	1.1450	9.1145			(27)				
Opening Type 3			5.3200	1.1450	6.0916			(27a)				
External Wall 1	74.8000	7.9600	66.8400	0.1600	10.6944	60.0000	4010.4000	(29a)				
External Wall 2	14.8600	1.8900	12.9700	0.1700	2.2049	190.0000	2464.3000	(29a)				
External Roof 1	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)				
External Roof 2	33.1800	5.3200	27.8600	0.1200	3.3432	9.0000	250.7400	(30)				
Total net area of external elements Aum(A, m2)			167.8400					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		39.0446			(33)				
Main dwelling												
Party Floor 1			78.1800			80.0000	6254.4000	(32d)				
Internal Wall 1			177.8200			9.0000	1600.3800	(32c)				
Heat capacity Cm = Sum(A x k)					(28)... (30) + (32) + (32a)... (32e) =		14985.2200	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							191.6759	(35)				
List of Thermal Bridges												
K1 Element					Length	Psi-value	Total					
E16 Corner (normal)					10.9300	0.0400	0.4372					
E17 Corner (inverted - internal area greater than external area)					2.0900	-0.0820	-0.1714					
E2 Other lintels (including other steel lintels)					5.7800	0.0500	0.2890					
E3 Sill					4.8800	0.0240	0.1171					
E4 Jamb					16.6000	0.0190	0.3154					
E7 Party floor between dwellings (in blocks of flats)					41.4200	0.0320	1.3254					
R1 Head of roof window					5.6000	0.2400	1.3440					
R2 Sill of roof window					5.6000	0.2400	1.3440					
R3 Jamb of roof window					13.3000	0.2400	3.1920					
E11 Eaves (insulation at rafter level)					28.8000	0.0200	0.5760					
E12 Gable (insulation at ceiling level)					7.7700	0.0450	0.3496					
E13 Gable (insulation at rafter level)					6.3200	0.0550	0.3476					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4660	(36)				
Point Thermal bridges							0.0000					
Total fabric heat loss						(33a) =						
						(33) + (36) + (36a) =	48.5106	(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												
	83.4803	83.3196	83.1620	82.4220	82.2836	81.6390	81.6390	81.5196	81.8873	82.2836	82.5637	82.8565 (39)
Average = Sum(39)m / 12 =												82.4213
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0678	1.0657	1.0637	1.0543	1.0525	1.0442	1.0442	1.0427	1.0474	1.0525	1.0561	1.0598 (40)
HLP (average)												1.0543
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 (42a)
Hot water usage for baths												28.0408 (42b)
Hot water usage for other uses												39.4892 (42c)
Average daily hot water use (litres/day)												61.8975 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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
Water storage loss (or HIU loss):												0.0000 (46)
Total storage loss												0.0000 (46)
If cylinder contains dedicated solar storage												0.0000 (56)

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											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	110.7055	122.5668	110.7055	114.3957	110.7055	114.3957	110.7055	110.7055	114.3957	110.7055	114.3957	110.7055	(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)	48.0168	46.8075	44.9407	41.4623	39.1684	36.8137	35.6577	37.0689	38.6558	41.2436	44.6058	47.6273	(72)
Total internal gains	433.7284	446.6176	427.2518	415.4617	394.3272	381.4236	367.0648	366.2389	377.1536	388.0531	410.2558	423.8263	(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					5.8200	19.6403	0.6300	0.7000			0.7700	34.9335 (76)	
West					2.1400	19.6403	0.6300	0.7000			0.7700	12.8450 (80)	
North					3.8000	26.0000	0.6300	0.7000			1.0000	39.2137 (82)	
South					1.5200	26.0000	0.6300	0.7000			1.0000	15.6855 (82)	

Solar gains	102.6777	207.4862	356.6280	541.2141	680.5278	703.9341	667.2007	561.8227	421.8425	250.2634	129.2539	83.6324 (83)	
Total gains	536.4061	654.1039	783.8798	956.6757	1074.8551	1085.3577	1034.2655	928.0616	798.9961	638.3165	539.5097	507.4586 (84)	

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)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.8628	49.9590	50.0536	50.5030	50.5880	50.9874	50.9874	51.0621	50.8328	50.5880	50.4164	50.2382	
alpha	4.3242	4.3306	4.3369	4.3669	4.3725	4.3992	4.3992	4.4041	4.3889	4.3725	4.3611	4.3492	
util living area	0.9900	0.9766	0.9399	0.8302	0.6566	0.4712	0.3451	0.3996	0.6536	0.9111	0.9799	0.9921	(86)
MIT	19.5219	19.7961	20.1959	20.6511	20.8978	20.9809	20.9961	20.9928	20.9264	20.5287	19.9371	19.4754	(87)
Th 2	20.0272	20.0289	20.0306	20.0384	20.0398	20.0466	20.0466	20.0479	20.0440	20.0398	20.0369	20.0338	(88)
util rest of house	0.9876	0.9710	0.9260	0.7965	0.6028	0.4049	0.2714	0.3190	0.5801	0.8841	0.9742	0.9901	(89)
MIT 2	18.6859	18.9574	19.3460	19.7703	19.9740	20.0376	20.0455	20.0456	20.0041	19.6747	19.1052	18.6449	(90)
Living area fraction	18.9947	19.2672	19.6599	20.0957	20.3152	20.3861	20.3967	20.3955	20.3448	19.9902	19.4125	18.9517	(91)
MIT	18.9947	19.2672	19.6599	20.0957	20.3152	20.3861	20.3967	20.3955	20.3448	19.9902	19.4125	18.9517	(92)
Temperature adjustment	18.9947	19.2672	19.6599	20.0957	20.3152	20.3861	20.3967	20.3955	20.3448	19.9902	19.4125	18.9517	(93)
adjusted MIT	18.9947	19.2672	19.6599	20.0957	20.3152	20.3861	20.3967	20.3955	20.3448	19.9902	19.4125	18.9517	(93)

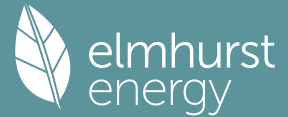
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9655	0.9197	0.7987	0.6188	0.4288	0.2986	0.3487	0.6043	0.8824	0.9694	0.9871	(94)
Useful gains	527.8619	631.5450	720.9657	764.0982	665.1066	465.4253	308.8711	323.6030	482.8248	563.2804	522.9773	500.9123	(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	1226.7194	1197.0682	1094.4067	922.7705	708.8914	472.3704	309.9550	325.7109	511.3680	772.6596	1016.5653	1222.2718	(97)
Space heating kWh	519.9499	380.0316	277.8401	114.2441	32.5759	0.0000	0.0000	0.0000	0.0000	155.7782	355.3834	536.6915	(98a)
Space heating requirement - total per year (kWh/year)												2372.4946	
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	519.9499	380.0316	277.8401	114.2441	32.5759	0.0000	0.0000	0.0000	0.0000	155.7782	355.3834	536.6915	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2372.4946	
Space heating per m2												(98c) / (4) =	30.3466 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

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	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	767.4067	604.1287	619.5493	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9373	0.9664	0.9483	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	719.3093	583.8156	587.5184	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh													(103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	312.5831	383.9407	298.9359	0.0000	0.0000	0.0000	0.0000	(104)
Intermittency factor (Table 10b)									fc = cooled area / (4) =				1.0000 (105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	78.1458	95.9852	74.7340	0.0000	0.0000	0.0000	0.0000	(107)
Energy for space heating													248.8649 (107)
Energy for space cooling													30.3466 (99)
Total													3.1832 (108)
Fabric Energy Efficiency (DFEE)													33.5298 (109)
													33.5 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Main dwelling				
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

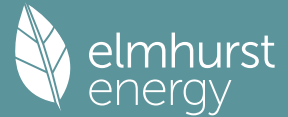
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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			7.9600	1.1450	9.1145			(27)
TER Roof Window			5.3200	1.1450	8.4682			(27a)
External Wall 1	74.8000	7.9600	66.8400	0.1800	12.0312			(29a)
External Wall 2	14.8600	1.8900	12.9700	0.1800	2.3346			(29a)
External Roof 1	45.0000		45.0000	0.1100	4.9500			(30)
External Roof 2	33.1800	5.3200	27.8600	0.1100	3.0646			(30)
Total net area of external elements Aum(A, m ²)			167.8400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	41.8531		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.6759	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E16 Corner (normal)				10.9300	0.0900	0.9837		
E17 Corner (inverted - internal area greater than external area)				2.0900	-0.0900	-0.1881		
E2 Other lintels (including other steel lintels)				5.7800	0.0500	0.2890		
E3 Sill				4.8800	0.0500	0.2440		
E4 Jamb				16.6000	0.0500	0.8300		
E7 Party floor between dwellings (in blocks of flats)				41.4200	0.0700	2.8994		
R1 Head of roof window				5.6000	0.0800	0.4480		
R2 Sill of roof window				5.6000	0.0600	0.3360		
R3 Jamb of roof window				13.3000	0.0800	1.0640		

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E11 Eaves (insulation at rafter level)	28.8000	0.0400	1.1520
E12 Gable (insulation at ceiling level)	7.7700	0.0600	0.4662
E13 Gable (insulation at rafter level)	6.3200	0.0800	0.5056
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.0298 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	50.8829 (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	
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	85.8526	85.6918	85.5343	84.7942	84.6558	84.0112	84.0112	83.8919	84.2595	84.6558	84.9359	85.2287 (39)
Average = Sum(39)m / 12 =												84.7936
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0981	1.0961	1.0941	1.0846	1.0828	1.0746	1.0746	1.0731	1.0778	1.0828	1.0864	1.0902 (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	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)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	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):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	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)
12Total per year (kWh/year)												873.7873 (64)
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	51.9898 (64a)
												874 (64)
												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	110.7055	122.5668	110.7055	114.3957	110.7055	114.3957	110.7055	110.7055	114.3957	110.7055	114.3957	110.7055 (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)	48.0168	46.8075	44.9407	41.4623	39.1684	36.8137	35.6577	37.0689	38.6558	41.2436	44.6058	47.6273 (72)
Total internal gains	433.7284	446.6176	427.2518	415.4617	394.3272	381.4236	367.0648	366.2389	377.1536	388.0531	410.2558	423.8263 (73)

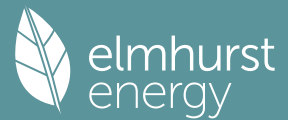
6. Solar gains

[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	5.8200	19.6403	0.6300	0.7000	0.7700	34.9335 (76)
West	2.1400	19.6403	0.6300	0.7000	0.7700	12.8450 (80)
North	3.8000	26.0000	0.6300	0.7000	1.0000	39.2137 (82)
South	1.5200	26.0000	0.6300	0.7000	1.0000	15.6855 (82)
Solar gains	102.6777	207.4862	356.6280	541.2141	680.5278	703.9341
Total gains	536.4061	654.1039	783.8798	956.6757	1074.8551	1085.3577
						667.2007
						1034.2655
						561.8227
						421.8425
						250.2634
						129.2539
						83.6324 (83)
						507.4586 (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	48.4850	48.5759	48.6654	49.0901	49.1704	49.5477	49.5477	49.6182	49.4017	49.1704	49.0083	48.8399
alpha	4.2323	4.2384	4.2444	4.2727	4.2780	4.3032	4.3032	4.3079	4.2934	4.2780	4.2672	4.2560
util living area	0.9902	0.9773	0.9423	0.8376	0.6683	0.4829	0.3546	0.4102	0.6655	0.9149	0.9805	0.9922 (86)
MIT	19.4647	19.7401	20.1460	20.6166	20.8824	20.9769	20.9951	20.9911	20.9151	20.4941	19.8887	19.4181 (87)
Th 2	20.0024	20.0040	20.0057	20.0134	20.0149	20.0216	20.0216	20.0229	20.0190	20.0149	20.0119	20.0089 (88)
util rest of house	0.9877	0.9718	0.9287	0.8042	0.6135	0.4138	0.2771	0.3257	0.5904	0.8884	0.9748	0.9902 (89)
MIT 2	18.6105	18.8832	19.2783	19.7182	19.9390	20.0108	20.0202	20.0200	19.9729	19.6224	19.0385	18.5692 (90)
Living area fraction	18.9261	19.1997	19.5989	20.0501	20.2874	20.3676	20.3803	20.3788	20.3210	19.9444	19.3526	18.8828 (91)
MIT	18.9261	19.1997	19.5989	20.0501	20.2874	20.3676	20.3803	20.3788	20.3210	19.9444	19.3526	18.8828 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9261	19.1997	19.5989	20.0501	20.2874	20.3676	20.3803	20.3788	20.3210	19.9444	19.3526	18.8828 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9842	0.9661	0.9221	0.8055	0.6293	0.4386	0.3057	0.3568	0.6147	0.8862	0.9699	0.9871 (94)
Useful gains	527.9096	631.9597	722.7963	770.6366	676.3917	476.0852	316.2209	331.1634	491.1133	565.6827	523.2537	500.9270 (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	1255.6872	1225.3713	1120.4023	945.4634	726.9771	484.5465	317.5914	333.7853	524.1747	791.0598	1040.6821	1251.3926 (97)
Space heating kWh	541.4665	398.7726	295.8188	125.8753	37.6355	0.0000	0.0000	0.0000	0.0000	167.6805	372.5485	558.3464 (98a)
Space heating requirement - total per year (kWh/year)												2498.1443
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	541.4665	398.7726	295.8188	125.8753	37.6355	0.0000	0.0000	0.0000	0.0000	167.6805	372.5485	558.3464 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2498.1443
Space heating per m2												31.9538 (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	789.7056	621.6832	637.5783	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9287	0.9608	0.9407	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	733.3706	597.2922	599.7485	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1153.4526	1099.8649	989.3139	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	302.4590	373.9141	289.8367	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	75.6147	93.4785	72.4592	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												241.5524 (107)
Energy for space heating												31.9538 (99)
Energy for space cooling												3.0897 (108)
Total												35.0434 (109)
Fabric Energy Efficiency (TFEE)												35.0 (109)

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

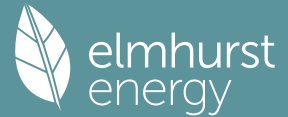
1. Overall dwelling characteristics

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

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Number of sides sheltered

4 (19)

Shelter factor

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

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.2874 \quad (21)$$

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)

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			7.9600	1.1450	9.1145			(27)
Opening Type 3			5.3200	1.1450	6.0916			(27a)
External Wall 1	74.8000	7.9600	66.8400	0.1600	10.6944	60.0000	4010.4000	(29a)
External Wall 2	14.8600	1.8900	12.9700	0.1700	2.2049	190.0000	2464.3000	(29a)
External Roof 1	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
External Roof 2	33.1800	5.3200	27.8600	0.1200	3.3432	9.0000	250.7400	(30)
Total net area of external elements Aum(A, m2)			167.8400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.0446		(33)
Main dwelling								
Party Floor 1			78.1800			80.0000	6254.4000	(32d)
Internal Wall 1			177.8200			9.0000	1600.3800	(32c)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(28)...(30) + (32) + (32a)...(32e) = 14985.2200 (34)
List of Thermal Bridges								191.6759 (35)
K1 Element				Length	Psi-value		Total	
E16 Corner (normal)				10.9300	0.0400		0.4372	
E17 Corner (inverted - internal area greater than external area)				2.0900	-0.0820		-0.1714	
E2 Other lintels (including other steel lintels)				5.7800	0.0500		0.2890	
E3 Sill				4.8800	0.0240		0.1171	
E4 Jamb				16.6000	0.0190		0.3154	
E7 Party floor between dwellings (in blocks of flats)				41.4200	0.0320		1.3254	
R1 Head of roof window				5.6000	0.2400		1.3440	
R2 Sill of roof window				5.6000	0.2400		1.3440	
R3 Jamb of roof window				13.3000	0.2400		3.1920	
E11 Eaves (insulation at rafter level)				28.8000	0.0200		0.5760	
E12 Gable (insulation at ceiling level)				7.7700	0.0450		0.3496	
E13 Gable (insulation at rafter level)				6.3200	0.0550		0.3476	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4660	(36)
Point Thermal bridges							0.0000	(36a) =
Total fabric heat loss							(33) + (36) + (36a) =	48.5106 (37)

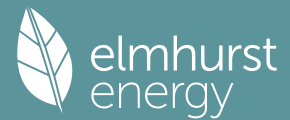
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan 34.9697	Feb 34.8090	Mar 34.6514	Apr 33.9114	May 33.7729	Jun 33.1284	Jul 33.1284	Aug 33.0090	Sep 33.3766	Oct 33.7729	Nov 34.0530	Dec 34.3458 (38)
Heat transfer coeff	83.4803	83.3196	83.1620	82.4220	82.2836	81.6390	81.6390	81.5196	81.8873	82.2836	82.5637	82.8565 (39)
Average = Sum(39)m / 12 =												82.4213
HLP	Jan 1.0678	Feb 1.0657	Mar 1.0637	Apr 1.0543	May 1.0525	Jun 1.0442	Jul 1.0442	Aug 1.0427	Sep 1.0474	Oct 1.0525	Nov 1.0561	Dec 1.0598 (40)
HLP (average)												1.0543
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)
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	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	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)
								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													

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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	23.2358	20.6379	16.7838	12.7064	9.4982	8.0188	8.6646	11.2626	15.1166	19.1940	22.4022	23.8816	(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	597.7997	596.1221	579.1944	546.9916	514.9159	485.6459	468.0780	470.6546	486.8130	516.0585	551.6685	582.9419	(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					5.8200	19.6403	0.6300	0.7000			0.7700			34.9335 (76)
West					2.1400	19.6403	0.6300	0.7000			0.7700			12.8450 (80)
North					3.8000	26.0000	0.6300	0.7000			1.0000			39.2137 (82)
South					1.5200	26.0000	0.6300	0.7000			1.0000			15.6855 (82)

Solar gains	102.6777	207.4862	356.6280	541.2141	680.5278	703.9341	667.2007	561.8227	421.8425	250.2634	129.2539			83.6324 (83)
Total gains	700.4774	803.6084	935.8224	1088.2057	1195.4438	1189.5800	1135.2786	1032.4774	908.6555	766.3219	680.9224			666.5742 (84)

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)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	49.8628	49.9590	50.0536	50.5030	50.5880	50.9874	50.9874	51.0621	50.8328	50.5880	50.4164	50.2382	
alpha	4.3242	4.3306	4.3369	4.3669	4.3725	4.3992	4.3992	4.4041	4.3889	4.3725	4.3611	4.3492	
util living area	0.9740	0.9534	0.8994	0.7766	0.6041	0.4325	0.3150	0.3605	0.5901	0.8558	0.9556	0.9784	(86)
Living	19.7808	20.0142	20.3758	20.7384	20.9260	20.9863	20.9973	20.9952	20.9505	20.6564	20.1466	19.7306	
Non living	18.6321	18.9240	19.3651	19.7867	19.9799	20.0385	20.0456	20.0459	20.0106	19.7115	19.0998	18.5739	
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	20.3763	20.0142	20.3758	20.7384	20.9260	20.9863	20.9973	20.9952	20.9505	20.6564	20.1466	19.9082	(87)
Th 2	20.0272	20.0289	20.0306	20.0384	20.0398	20.0466	20.0466	20.0479	20.0440	20.0398	20.0369	20.0338	(88)
util rest of house	0.9680	0.9433	0.8791	0.7387	0.5513	0.3707	0.2474	0.2872	0.5190	0.8193	0.9441	0.9734	(89)
MIT 2	19.4710	18.9240	19.3651	19.7867	19.9799	20.0385	20.0456	20.0459	20.0106	19.7115	19.0998	18.8370	(90)
Living area fraction	19.8054	19.3267	19.7384	20.1383	20.3294	20.3886	20.3972	20.3966	fLA = Living area / (4) =	20.0606	19.4865	19.2327	(91)
MIT	19.8054	19.3267	19.7384	20.1383	20.3294	20.3886	20.3972	20.3966	20.3578	20.0606	19.4865	19.2327	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8054	19.3267	19.7384	20.1383	20.3294	20.3886	20.3972	20.3966	20.3578	20.0606	19.4865	19.2327	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9665	0.9344	0.8722	0.7429	0.5676	0.3931	0.2724	0.3142	0.5431	0.8202	0.9361	0.9682	(94)
Useful gains	676.9947	750.8648	816.1942	808.4467	678.5834	467.6351	309.2509	324.4122	493.4809	628.5372	637.3914	645.3966	(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	1294.3992	1202.0300	1100.9348	926.2827	710.0539	472.5767	309.9978	325.8022	512.4347	778.4479	1022.6735	1245.5553	(97)
Space heating kWh	459.3490	303.1830	211.8470	84.8419	23.4140	0.0000	0.0000	0.0000	0.0000	111.5336	277.4031	446.5181	(98a)
Space heating requirement - total per year (kWh/year)												1918.0897	
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	459.3490	303.1830	211.8470	84.8419	23.4140	0.0000	0.0000	0.0000	0.0000	111.5336	277.4031	446.5181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1918.0897	
Space heating per m ²										(98c) / (4) =		24.5343	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from main system(s)												0.0000	(201)
Efficiency of main space heating system 1 (in %)												1.0000	(202)
Efficiency of main space heating system 2 (in %)												218.9288	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(207)
												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	459.3490	303.1830	211.8470	84.8419	23.4140	0.0000	0.0000	0.0000	0.0000	111.5336	277.4031	446.5181	(98)
Space heating efficiency (main heating system 1)	218.9288	218.9288	218.9288	218.9288	218.9288	0.0000	0.0000	0.0000	0.0000	218.9288	218.9288	218.9288	(210)
Space heating fuel (main heating system)	209.8166	138.4847	96.7652	38.7532	10.6948	0.0000	0.0000	0.0000	0.0000	50.9451	126.7093	203.9558	(211)

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Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	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	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	(216)
Fuel for water heating, kWh/month	149.8352	132.5624	140.8521	123.7658	119.9526	108.0528	106.5579	110.7687	111.9732	124.9132	132.9073	148.1781	(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	20.3382	16.3161	14.6908	10.7631	8.3137	6.7924	7.5841	9.8581	12.8046	16.8004	18.9760	20.9035	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.1144	-38.0490	-58.2919	-68.8150	-76.9869	-72.6249	-71.6313	-65.8094	-55.7660	-44.3970	-28.3010	-21.3615	(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	-6.1896	-14.1885	-30.6746	-50.4175	-70.3149	-72.1961	-71.2759	-59.0493	-42.0235	-22.3816	-8.8302	-4.8347	(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												876.1247	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.3047	
Water heating fuel used												1510.3193	(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)												164.1409	(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												1471.0602	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	876.1247	16.4900	144.4730 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1510.3193	16.4900	249.0517 (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	164.1409	16.4900	27.0668 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-627.1483	16.4900	-103.4167
PV Unit electricity exported	-452.3764	5.5900	-25.2878
Total			-128.7046 (252)
Total energy cost			291.8869 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8531 (257)
SAP value		86.1720
SAP rating (Section 12)		86 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	876.1247	0.1569	137.4226 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1510.3193	0.1409	212.7871 (264)
Space and water heating			350.2097 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	164.1409	0.1443	23.6906 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-627.1483	0.1335	-83.7365
PV Unit electricity exported	-452.3764	0.1236	-55.9193
Total			-139.6558 (269)
Total CO2, kg/year			234.2445 (272)
CO2 emissions per m2			3.0000 (273)
EI value			97.4518
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
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

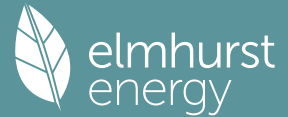
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	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			7.9600	1.1450	9.1145			(27)				
Opening Type 3			5.3200	1.1450	6.0916			(27a)				
External Wall 1	74.8000	7.9600	66.8400	0.1600	10.6944	60.0000	4010.4000	(29a)				
External Wall 2	14.8600	1.8900	12.9700	0.1700	2.2049	190.0000	2464.3000	(29a)				
External Roof 1	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)				
External Roof 2	33.1800	5.3200	27.8600	0.1200	3.3432	9.0000	250.7400	(30)				
Total net area of external elements Aum(A, m2)			167.8400					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0446			(33)				
Main dwelling												
Party Floor 1			78.1800			80.0000	6254.4000	(32d)				
Internal Wall 1			177.8200			9.0000	1600.3800	(32c)				
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14985.2200	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							191.6759	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E16 Corner (normal)				10.9300	0.0400	0.4372						
E17 Corner (inverted - internal area greater than external area)				2.0900	-0.0820	-0.1714						
E2 Other lintels (including other steel lintels)				5.7800	0.0500	0.2890						
E3 Sill				4.8800	0.0240	0.1171						
E4 Jamb				16.6000	0.0190	0.3154						
E7 Party floor between dwellings (in blocks of flats)				41.4200	0.0320	1.3254						
R1 Head of roof window				5.6000	0.2400	1.3440						
R2 Sill of roof window				5.6000	0.2400	1.3440						
R3 Jamb of roof window				13.3000	0.2400	3.1920						
E11 Eaves (insulation at rafter level)				28.8000	0.0200	0.5760						
E12 Gable (insulation at ceiling level)				7.7700	0.0450	0.3496						
E13 Gable (insulation at rafter level)				6.3200	0.0550	0.3476						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4660	(36)				
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	48.5106	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.1978	Feb 33.9114	Mar 33.9114	Apr 33.5055	May 33.5055	Jun 33.0090	Jul 33.0090	Aug 32.7798	Sep 33.1284	Oct 33.6376	Nov 33.3766	Dec 33.7729 (38)
Heat transfer coeff	82.7085	82.4220	82.4220	82.0162	82.0162	81.5196	81.5196	81.2905	81.6390	82.1483	81.8873	82.2836 (39)
Average = Sum(39)m / 12 =												81.9894
HLP	Jan 1.0579	Feb 1.0543	Mar 1.0543	Apr 1.0491	May 1.0491	Jun 1.0427	Jul 1.0427	Aug 1.0398	Sep 1.0442	Oct 1.0508	Nov 1.0474	Dec 1.0525 (40)
HLP (average)												1.0487

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

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												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)

	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 (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												
(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												
	23.2358	20.6379	16.7838	12.7064	9.4982	8.0188	8.6646	11.2626	15.1166	19.1940	22.4022	23.8816 (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												
	597.7997	596.1221	579.1944	546.9916	514.9159	485.6459	468.0780	470.6546	486.8130	516.0585	551.6685	582.9419 (73)

6. Solar gains												

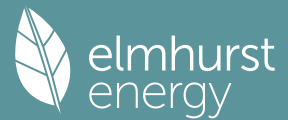
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
East	5.8200											42.3354 (76)
West	2.1400											15.5666 (80)
North	3.8000											48.2630 (82)
South	1.5200											19.3052 (82)

Solar gains	125.4703	221.4026	373.1384	578.3962	702.9595	768.5527	721.4232	623.7887	470.8175	282.6390	151.6897	102.7893 (83)
Total gains	723.2700	817.5247	952.3328	1125.3878	1217.8755	1254.1986	1189.5012	1094.4433	957.6305	798.6975	703.3583	685.7312 (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	50.3281	50.5030	50.5030	50.7529	50.7529	51.0621	51.0621	51.2060	50.9874	50.6713	50.8328	50.5880
alpha	4.3552	4.3669	4.3669	4.3835	4.3835	4.4041	4.4041	4.4137	4.3992	4.3781	4.3889	4.3725
util living area												
	0.9681	0.9458	0.8826	0.7361	0.5557	0.3613	0.2531	0.2815	0.5277	0.8213	0.9439	0.9733 (86)
Living	19.8878	20.1053	20.4616	20.8026	20.9508	20.9941	20.9991	20.9986	20.9704	20.7296	20.2543	19.8419
Non living	18.7723	19.0439	19.4733	19.8589	20.0051	20.0449	20.0476	20.0499	20.0283	19.7925	19.2377	18.7187
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	20.4310	20.1053	20.4616	20.8026	20.9508	20.9941	20.9991	20.9986	20.9704	20.7296	20.2543	20.0039 (87)
Th 2	20.0353	20.0384	20.0384	20.0426	20.0426	20.0479	20.0479	20.0503	20.0466	20.0412	20.0440	20.0398 (88)
util rest of house												

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MIT 2	0.9608	0.9341	0.8593	0.6944	0.5007	0.3010	0.1882	0.2115	0.4557	0.7784	0.9296	0.9671 (89)
Living area fraction	19.5318	19.0439	19.4733	19.8589	20.0051	20.0449	20.0476	20.0499	20.0283	19.7925	19.2377	18.9567 (90)
MIT	19.8640	19.4360	19.8384	20.2075	20.3544	20.3955	20.3991	20.4003	fLA = Living area / (4) =	20.3763	20.1386	19.3436 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	19.8640	19.4360	19.8384	20.2075	20.3544	20.3955	20.3991	20.4003	20.3763	20.1386	19.6132	19.3436 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9594	0.9254	0.8539	0.7019	0.5190	0.3231	0.2122	0.2374	0.4811	0.7832	0.9218	0.9615	(94)
Useful gains	693.8802	756.4973	813.1536	789.9322	632.0536	405.2902	252.4209	259.8067	460.7298	625.5490	648.3569	659.3289	(95)
Ext temp.	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)
Heat loss rate W	1254.1906	1165.1189	1058.1629	878.1909	652.3923	407.2348	252.6375	260.1562	471.5749	742.5095	983.7323	1204.9248	(97)
Space heating kWh	416.8709	274.5937	182.2869	63.5463	15.1320	0.0000	0.0000	0.0000	0.0000	87.0186	241.4703	405.9234	(98a)
Space heating requirement - total per year (kWh/year)												1686.8421	
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	416.8709	274.5937	182.2869	63.5463	15.1320	0.0000	0.0000	0.0000	0.0000	87.0186	241.4703	405.9234	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1686.8421	
Space heating per m2										(98c) / (4) =		21.5764	(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 %)													218.8825 (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	416.8709	274.5937	182.2869	63.5463	15.1320	0.0000	0.0000	0.0000	0.0000	87.0186	241.4703	405.9234	(98)
Space heating efficiency (main heating system 1)	218.8825	218.8825	218.8825	218.8825	218.8825	0.0000	0.0000	0.0000	0.0000	218.8825	218.8825	218.8825	(210)
Space heating fuel (main heating system)	190.4542	125.4525	83.2807	29.0321	6.9133	0.0000	0.0000	0.0000	0.0000	39.7559	110.3196	185.4526	(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	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	(216)
Fuel for water heating, kWh/month	149.8222	132.5509	140.8399	123.7551	119.9422	108.0434	106.5486	110.7591	111.9635	124.9023	132.8958	148.1652	(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	20.3382	16.3161	14.6908	10.7631	8.3137	6.7924	7.5841	9.8581	12.8046	16.8004	18.9760	20.9035	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-29.2525	-39.2867	-59.2016	-71.0056	-77.9301	-76.4721	-74.9284	-70.0340	-59.5913	-47.7793	-31.6706	-25.0494	(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)	-8.1222	-15.2639	-32.2384	-54.8025	-72.8879	-80.5169	-78.3804	-67.0768	-47.8351	-26.1177	-10.9212	-6.3988	(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												770.6610	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.3200	
Water heating fuel used												1510.1883	(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)												164.1409	(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												1282.2267	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	770.6610	27.6700	213.2419 (240)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1510.1883	27.6700	417.8691 (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	164.1409	27.6700	45.4178 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-662.2018	27.6700	-183.2312
PV Unit electricity exported	-500.5617	5.8100	-29.0826
Total			-212.3139 (252)
Total energy cost			464.2149 (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	770.6610	0.1573	121.2164 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1510.1883	0.1409	212.7686 (264)
Space and water heating			333.9850 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	164.1409	0.1443	23.6906 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-662.2018	0.1337	-88.5234
PV Unit electricity exported	-500.5617	0.1236	-61.8774
Total			-150.4008 (269)
Total CO2, kg/year			207.2748 (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	770.6610	1.5822	1219.3737 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1510.1883	1.5210	2296.9287 (278)
Space and water heating			3516.3024 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	164.1409	1.5338	251.7647 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-662.2018	1.4940	-989.3285
PV Unit electricity exported	-500.5617	0.4536	-227.0477
Total			-1216.3762 (283)
Total Primary energy kWh/year			2551.6910 (286)

SAP 10 EPC IMPROVEMENTS

03 ashp + PV

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

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

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

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

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

Fuel prices for cost data on this page from database revision number 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 £677	Potential £677	Saving £0
Electricity			
Space heating	£213	£213	£0
Water heating	£418	£418	£0
Lighting	£45	£45	£0
Generated (PV)	-£212	-£212	£0
Total cost of fuels	£465	£465	£0
Total cost of uses	£464	£464	£0
Delivered energy	16 kWh/m²	16 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	33 kWh/m²	33 kWh/m²	0 kWh/m²

Full SAP Calculation Printout



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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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)
Air changes per hour	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

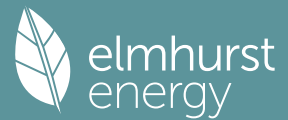
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Opening Type 1			1.8900	1.4000	2.6460		(26)
Opening Type 2			7.9600	1.1450	9.1145		(27)
Opening Type 3			5.3200	1.1450	6.0916		(27a)
External Wall 1	74.8000		66.8400	0.1600	10.6944	60.0000	4010.4000 (29a)
External Wall 2	14.8600	1.8900	12.9700	0.1700	2.2049	190.0000	2464.3000 (29a)
External Roof 1	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000 (30)
External Roof 2	33.1800	5.3200	27.8600	0.1200	3.3432	9.0000	250.7400 (30)
Total net area of external elements Aum(A, m ²)			167.8400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0446		(33)
Main dwelling							
Party Floor 1			78.1800			80.0000	6254.4000 (32d)
Internal Wall 1			177.8200			9.0000	1600.3800 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 14985.2200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.6759 (35)

List of Thermal Bridges	K1 Element	Length	Psi-value	Total
E16 Corner (normal)		10.9300	0.0400	0.4372
E17 Corner (inverted - internal area greater than external area)		2.0900	-0.0820	-0.1714
E2 Other lintels (including other steel lintels)		5.7800	0.0500	0.2890
E3 Sill		4.8800	0.0240	0.1171
E4 Jamb		16.6000	0.0190	0.3154
E7 Party floor between dwellings (in blocks of flats)		41.4200	0.0320	1.3254
R1 Head of roof window		5.6000	0.2400	1.3440
R2 Sill of roof window		5.6000	0.2400	1.3440
R3 Jamb of roof window		13.3000	0.2400	3.1920
E11 Eaves (insulation at rafter level)		28.8000	0.0200	0.5760
E12 Gable (insulation at ceiling level)		7.7700	0.0450	0.3496
E13 Gable (insulation at rafter level)		6.3200	0.0550	0.3476
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.4660 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 48.5106 (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 =	83.4803	83.3196	83.1620	82.4220	82.2836	81.6390	81.6390	81.5196	81.8873	82.2836	82.5637	82.8565 (39)
												82.4213
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0678	1.0657	1.0637	1.0543	1.0525	1.0442	1.0442	1.0427	1.0474	1.0525	1.0561	1.0598 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

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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 content	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	(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	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	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	(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												
23.2358	20.6379	16.7838	12.7064	9.4982	8.0188	8.6646	11.2626	15.1166	19.1940	22.4022	23.8816	(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	(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	597.7997	596.1221	579.1944	546.9916	514.9159	485.6459	468.0780	470.6546	486.8130	516.0585	551.6685	582.9419 (73)

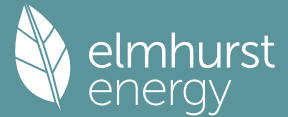
6. Solar gains

[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				5.8200	19.6403		0.6300		0.7000		0.7700		34.9335 (76)
West				2.1400	19.6403		0.6300		0.7000		0.7700		12.8450 (80)
North				3.8000	26.0000		0.6300		0.7000		1.0000		39.2137 (82)
South				1.5200	26.0000		0.6300		0.7000		1.0000		15.6855 (82)
Solar gains	102.6777	207.4862	356.6280	541.2141	680.5278	703.9341	667.2007	561.8227	421.8425	250.2634	129.2539		83.6324 (83)
Total gains	700.4774	803.6084	935.8224	1088.2057	1195.4438	1189.5800	1135.2786	1032.4774	908.6555	766.3219	680.9224		666.5742 (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	49.8628	49.9590	50.0536	50.5030	50.5880	50.9874	50.9874	51.0621	50.8328	50.5880	50.4164	50.2382
alpha	4.3242	4.3306	4.3369	4.3669	4.3725	4.3992	4.3992	4.4041	4.3889	4.3725	4.3611	4.3492
util living area	0.9740	0.9534	0.8994	0.7766	0.6041	0.4325	0.3150	0.3605	0.5901	0.8558	0.9556	0.9784 (86)
Living	19.7808	20.0142	20.3758	20.7384	20.9260	20.9863	20.9973	20.9952	20.9505	20.6564	20.1466	19.7306
Non living	18.6321	18.9240	19.3651	19.7867	19.9799	20.0385	20.0456	20.0459	20.0106	19.7115	19.0998	18.5739
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	20.3763	20.0142	20.3758	20.7384	20.9260	20.9863	20.9973	20.9952	20.9505	20.6564	20.1466	19.9082 (87)
Th 2	20.0272	20.0289	20.0306	20.0384	20.0398	20.0466	20.0466	20.0479	20.0440	20.0398	20.0369	20.0338 (88)
util rest of house	0.9680	0.9433	0.8791	0.7387	0.5513	0.3707	0.2474	0.2872	0.5190	0.8193	0.9441	0.9734 (89)
MIT 2	19.4710	18.9240	19.3651	19.7867	19.9799	20.0385	20.0456	20.0459	20.0106	19.7115	19.0998	18.8370 (90)
Living area fraction												fLA = Living area / (4) = 0.3694 (91)
MIT	19.8054	19.3267	19.7384	20.1383	20.3294	20.3886	20.3972	20.3966	20.3578	20.0606	19.4865	19.2327 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8054	19.3267	19.7384	20.1383	20.3294	20.3886	20.3972	20.3966	20.3578	20.0606	19.4865	19.2327 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9665	0.9344	0.8722	0.7429	0.5676	0.3931	0.2724	0.3142	0.5431	0.8202	0.9361	0.9682	(94)
Useful gains	676.9947	750.8648	816.1942	808.4467	678.5834	467.6351	309.2509	324.4122	493.4809	628.5372	637.3914	645.3966	(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	1294.3992	1202.0300	1100.9348	926.2827	710.0539	472.5767	309.9978	325.8022	512.4347	778.4479	1022.6735	1245.5553	(97)
Space heating kWh	459.3490	303.1830	211.8470	84.8419	23.4140	0.0000	0.0000	0.0000	0.0000	111.5336	277.4031	446.5181	(98a)
Space heating requirement - total per year (kWh/year)												1918.0897	
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	459.3490	303.1830	211.8470	84.8419	23.4140	0.0000	0.0000	0.0000	0.0000	111.5336	277.4031	446.5181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1918.0897	
Space heating per m2										(98c) / (4) =		24.5343	(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 %)													218.9288	(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	459.3490	303.1830	211.8470	84.8419	23.4140	0.0000	0.0000	0.0000	0.0000	111.5336	277.4031	446.5181	(98)	
Space heating efficiency (main heating system 1)	218.9288	218.9288	218.9288	218.9288	218.9288	0.0000	0.0000	0.0000	0.0000	218.9288	218.9288	218.9288	(210)	
Space heating fuel (main heating system)	209.8166	138.4847	96.7652	38.7532	10.6948	0.0000	0.0000	0.0000	0.0000	50.9451	126.7093	203.9558	(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	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	176.3047	(216)	
Fuel for water heating, kWh/month	149.8352	132.5624	140.8521	123.7658	119.9526	108.0528	106.5579	110.7687	111.9732	124.9132	132.9073	148.1781	(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	20.3382	16.3161	14.6908	10.7631	8.3137	6.7924	7.5841	9.8581	12.8046	16.8004	18.9760	20.9035	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-25.1144	-38.0490	-58.2919	-68.8150	-76.9869	-72.6249	-71.6313	-65.8094	-55.7660	-44.3970	-28.3010	-21.3615	(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	-6.1896	-14.1885	-30.6746	-50.4175	-70.3149	-72.1961	-71.2759	-59.0493	-42.0235	-22.3816	-8.8302	-4.8347	(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												876.1247	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												176.3047		
Water heating fuel used												1510.3193	(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)												164.1409	(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												1471.0602	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	876.1247	16.4900	144.4730	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1510.3193	16.4900	249.0517	(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	164.1409	16.4900	27.0668	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				

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PV Unit electricity used in dwelling	-627.1483	16.4900	-103.4167
PV Unit electricity exported	-452.3764	5.5900	-25.2878
Total			-128.7046 (252)
Total energy cost			291.8869 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8531 (257)
SAP value		86.1720
SAP rating (Section 12)		86 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	876.1247	0.1569	137.4226 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1510.3193	0.1409	212.7871 (264)
Space and water heating			350.2097 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	164.1409	0.1443	23.6906 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-627.1483	0.1335	-83.7365
PV Unit electricity exported	-452.3764	0.1236	-55.9193
Total			-139.6558 (269)
Total CO2, kg/year			234.2445 (272)
CO2 emissions per m2			3.0000 (273)
EI value			97.4518
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	78.1800 (1b)	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

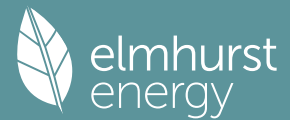
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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	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			7.9600	1.1450	9.1145		(27)
Opening Type 3			5.3200	1.1450	6.0916		(27a)

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External Wall 1	74.8000	7.9600	66.8400	0.1600	10.6944	60.0000	4010.4000	(29a)					
External Wall 2	14.8600	1.8900	12.9700	0.1700	2.2049	190.0000	2464.3000	(29a)					
External Roof 1	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)					
External Roof 2	33.1800	5.3200	27.8600	0.1200	3.3432	9.0000	250.7400	(30)					
Total net area of external elements Aum(A, m2)			167.8400					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	39.0446				(33)					
Main dwelling													
Party Floor 1		78.1800				80.0000	6254.4000	(32d)					
Internal Wall 1		177.8200				9.0000	1600.3800	(32c)					
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 14985.2200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								191.6759 (35)					
List of Thermal Bridges													
K1 Element			Length	Psi-value	Total								
E16 Corner (normal)			10.9300	0.0400	0.4372								
E17 Corner (inverted - internal area greater than external area)			2.0900	-0.0820	-0.1714								
E2 Other lintels (including other steel lintels)			5.7800	0.0500	0.2890								
E3 Sill			4.8800	0.0240	0.1171								
E4 Jamb			16.6000	0.0190	0.3154								
E7 Party floor between dwellings (in blocks of flats)			41.4200	0.0320	1.3254								
R1 Head of roof window			5.6000	0.2400	1.3440								
R2 Sill of roof window			5.6000	0.2400	1.3440								
R3 Jamb of roof window			13.3000	0.2400	3.1920								
E11 Eaves (insulation at rafter level)			28.8000	0.0200	0.5760								
E12 Gable (insulation at ceiling level)			7.7700	0.0450	0.3496								
E13 Gable (insulation at rafter level)			6.3200	0.0550	0.3476								
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4660	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	48.5106 (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 =	82.7085	82.4220	82.4220	82.0162	82.0162	81.5196	81.5196	81.2905	81.6390	82.1483	81.8873	82.2836	(39)
												81.9894	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0579	1.0543	1.0543	1.0491	1.0491	1.0427	1.0427	1.0398	1.0442	1.0508	1.0474	1.0525	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.0487	
												31	

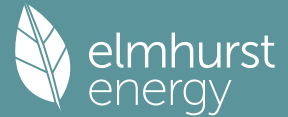
4. Water heating energy requirements (kWh/year)

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)
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	(64a)
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													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	23.2358	20.6379	16.7838	12.7064	9.4982	8.0188	8.6646	11.2626	15.1166	19.1940	22.4022	23.8816	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
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	597.7997	596.1221	579.1944	546.9916	514.9159	485.6459	468.0780	470.6546	486.8130	516.0585	551.6685	582.9419	(73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East					5.8200	23.8018	0.6300	0.7000	0.7700	42.3354 (76)		
West					2.1400	23.8018	0.6300	0.7000	0.7700	15.5666 (80)		
North					3.8000	32.0000	0.6300	0.7000	1.0000	48.2630 (82)		
South					1.5200	32.0000	0.6300	0.7000	1.0000	19.3052 (82)		
Solar gains	125.4703	221.4026	373.1384	578.3962	702.9595	768.5527	721.4232	623.7887	470.8175	282.6390	151.6897	102.7893 (83)
Total gains	723.2700	817.5247	952.3328	1125.3878	1217.8755	1254.1986	1189.5012	1094.4433	957.6305	798.6975	703.3583	685.7312 (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	50.3281	50.5030	50.5030	50.7529	50.7529	51.0621	51.0621	51.2060	50.9874	50.6713	50.8328	50.5880	
alpha	4.3552	4.3669	4.3669	4.3835	4.3835	4.4041	4.4041	4.4137	4.3992	4.3781	4.3889	4.3725	
util living area	0.9681	0.9458	0.8826	0.7361	0.5557	0.3613	0.2531	0.2815	0.5277	0.8213	0.9439	0.9733	(86)
Living	19.8878	20.1053	20.4616	20.8026	20.9508	20.9941	20.9991	20.9986	20.9704	20.7296	20.2543	19.8419	
Non living	18.7723	19.0439	19.4733	19.8589	20.0051	20.0449	20.0476	20.0499	20.0283	19.7925	19.2377	18.7187	
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	20.4310	20.1053	20.4616	20.8026	20.9508	20.9941	20.9991	20.9986	20.9704	20.7296	20.2543	20.0039	(87)
Th 2	20.0353	20.0384	20.0384	20.0426	20.0426	20.0479	20.0479	20.0503	20.0466	20.0412	20.0440	20.0398	(88)
util rest of house	0.9608	0.9341	0.8593	0.6944	0.5007	0.3010	0.1882	0.2115	0.4557	0.7784	0.9296	0.9671	(89)
MIT 2	19.5318	19.0439	19.4733	19.8589	20.0051	20.0449	20.0476	20.0499	20.0283	19.7925	19.2377	18.9567	(90)
Living area fraction									fLA = Living area / (4) =			0.3694	(91)
MIT	19.8640	19.4360	19.8384	20.2075	20.3544	20.3955	20.3991	20.4003	20.3763	20.1386	19.6132	19.3436	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8640	19.4360	19.8384	20.2075	20.3544	20.3955	20.3991	20.4003	20.3763	20.1386	19.6132	19.3436	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9594	0.9254	0.8539	0.7019	0.5190	0.3231	0.2122	0.2374	0.4811	0.7832	0.9218	0.9615	(94)
Useful gains	693.8802	756.4973	813.1536	789.9322	632.0536	405.2902	252.4209	259.8067	460.7298	625.5490	648.3569	659.3289	(95)
Ext temp.	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)
Heat loss rate W	1254.1906	1165.1189	1058.1629	878.1909	652.3923	407.2348	252.6375	260.1562	471.5749	742.5095	983.7323	1204.9248	(97)
Space heating kWh	416.8709	274.5937	182.2869	63.5463	15.1320	0.0000	0.0000	0.0000	0.0000	87.0186	241.4703	405.9234	(98a)
Space heating requirement - total per year (kWh/year)												1686.8421	
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	416.8709	274.5937	182.2869	63.5463	15.1320	0.0000	0.0000	0.0000	0.0000	87.0186	241.4703	405.9234	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1686.8421	
Space heating per m2										(98c) / (4) =		21.5764	(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 %)													218.8825	(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	416.8709	274.5937	182.2869	63.5463	15.1320	0.0000	0.0000	0.0000	0.0000	87.0186	241.4703	405.9234	(98)	
Space heating efficiency (main heating system 1)	218.8825	218.8825	218.8825	218.8825	218.8825	0.0000	0.0000	0.0000	0.0000	218.8825	218.8825	218.8825	(210)	
Space heating fuel (main heating system)	190.4542	125.4525	83.2807	29.0321	6.9133	0.0000	0.0000	0.0000	0.0000	39.7559	110.3196	185.4526	(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	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	176.3200	(216)	
Fuel for water heating, kWh/month	149.8222	132.5509	140.8399	123.7551	119.9422	108.0434	106.5486	110.7591	111.9635	124.9023	132.8958	148.1652	(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	20.3382	16.3161	14.6908	10.7631	8.3137	6.7924	7.5841	9.8581	12.8046	16.8004	18.9760	20.9035	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-29.2525	-39.2867	-59.2016	-71.0056	-77.9301	-76.4721	-74.9284	-70.0340	-59.5913	-47.7793	-31.6706	-25.0494	(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)	

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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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-8.1222	-15.2639	-32.2384	-54.8025	-72.8879	-80.5169	-78.3804	-67.0768	-47.8351	-26.1177	-10.9212	-6.3988	(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													770.6610	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													176.3200	
Water heating fuel used													1510.1883	(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)													164.1409	(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													1282.2267	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	770.6610	27.6700	213.2419	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1510.1883	27.6700	417.8691	(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	164.1409	27.6700	45.4178	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-662.2018	27.6700	-183.2312	
PV Unit electricity exported	-500.5617	5.8100	-29.0826	
Total			-212.3139	(252)
Total energy cost			464.2149	(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	770.6610	0.1573	121.2164	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1510.1883	0.1409	212.7686	(264)
Space and water heating			333.9850	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	164.1409	0.1443	23.6906	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-662.2018	0.1337	-88.5234	
PV Unit electricity exported	-500.5617	0.1236	-61.8774	
Total			-150.4008	(269)
Total CO2, kg/year			207.2748	(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	770.6610	1.5822	1219.3737	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1510.1883	1.5210	2296.9287	(278)
Space and water heating			3516.3024	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	164.1409	1.5338	251.7647	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-662.2018	1.4940	-989.3285	
PV Unit electricity exported	-500.5617	0.4536	-227.0477	
Total			-1216.3762	(283)
Total Primary energy kWh/year			2551.6910	(286)