

Full SAP Calculation Printout



Plot Reference	Cedar End			Issued on Date	29/01/2026
Assessment Reference	As Built	Plot Type Ref	L1A		
Plot Address	The Hollies, Eastergate Lane, CHICHESTER, PO20 3SJ			SAP Version	10.2
SAP Rating	78 C	DER	4.17	TER	8.82
Environmental	96 A	% DER < TER		52.72	
CO ₂ Emissions (t/year)	0.7	DFEE	55.18	TFEE	55.62
Compliance Check	See BREL	% DFEE < TFEE		0.80	
% DPER < TPER	12.15	DPER	43.62	TPER	49.65
Assessor Details	Mr. Neil Rothon			Assessor ID	L759-0001
Client	NJS, Joe Shopland				

SAP 10 WORKSHEET FOR New Build (As Built) (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	193.6700 (1b)	2.7300 (2b)	528.7191 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	528.7191 (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	0 * 10 = 0.0000 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.8200	(17)
Infiltration rate	0.1410	(18)
Number of sides sheltered	2	(19)

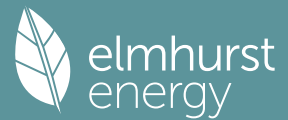
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1198 (21)

	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	0.1528	0.1498	0.1468	0.1318	0.1288	0.1139	0.1139	0.1109	0.1198	0.1288	0.1348	0.1408 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6000 (23c)
Effective ac	0.2748	0.2718	0.2688	0.2538	0.2508	0.2359	0.2359	0.2329	0.2418	0.2508	0.2568	0.2628 (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							
Front Door			1.9500	1.0000	1.9500		(26)
Windows			100.3400	0.8687	87.1680		(27)
Velux			3.4000	1.2357	4.2015		(27a)
Door to garage			1.6600	1.4000	2.3240		(26)
Heatloss Floor 1			193.6700	0.1100	21.3037	75.0000	14525.2500 (28a)
External Wall 1	227.5900	102.2900	125.3000	0.1200	15.0360	60.0000	7518.0000 (29a)
sheltered to garage	18.4200	1.6600	16.7600	0.9000	15.0840	115.0000	1927.4000 (29a)
flat ceiling	115.3500		115.3500	0.1000	11.5350	9.0000	1038.1500 (30)
Roof sloping main	88.4000	3.4000	85.0000	0.1300	11.0500	9.0000	765.0000 (30)
roof slope bed 2 above ceiling	19.7200		19.7200	0.1200	2.3664	9.0000	177.4800 (30)
Total net area of external elements A _{um} (A, m ²)			663.1500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		172.0186		(33)
Main dwelling							
Internal Wall 1			303.3500			75.0000	22751.2500 (32c)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ (28)...(30) + (32) + (32a)...(32e) = 48702.5300 (34)
List of Thermal Bridges 251.4717 (35)

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	84.4200	0.0730	6.1627
E5 Ground floor (normal)	7.2900	0.3200	2.3328
E16 Corner (normal)	15.0000	0.0360	0.5400
E17 Corner (inverted - internal area greater than external area)	20.0000	-0.0640	-1.2800
E10 Eaves (insulation at ceiling level)	41.4000	0.0670	2.7738
E12 Gable (insulation at ceiling level)	10.9400	0.0530	0.5798
E11 Eaves (insulation at rafter level)	20.8600	0.0240	0.5006
E13 Gable (insulation at rafter level)	16.3900	0.0490	0.8031
R11 Upstands or kerbs of rooflights	21.1200	0.2400	5.0688
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			17.4816 (36)
Point Thermal Bridges			0.0000 (36a) =
Total fabric heat loss			(33) + (36) + (36a) = 189.5002 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	47.9479	47.4251	46.9023	44.2884	43.7657	41.1518	41.1518	40.6290	42.1973	43.7657	44.8112	45.8568 (38)
Heat transfer coeff	237.4481	236.9253	236.4025	233.7887	233.2659	230.6520	230.6520	230.1292	231.6975	233.2659	234.3114	235.3570 (39)
Average = Sum(39)m / 12 =												233.6580
HLP	1.2260	1.2233	1.2206	1.2071	1.2045	1.1910	1.1910	1.1883	1.1964	1.2045	1.2098	1.2152 (40)
HLP (average)												1.2065
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9937 (42)
Hot water usage for mixer showers	74.4140	73.2957	71.6661	68.5482	66.2473	63.6813	62.2228	63.8400	65.6129	68.3679	71.5528	74.1289 (42a)
Hot water usage for baths	32.1237	31.6466	30.9748	29.7360	28.8085	27.7800	27.2244	27.8916	28.6179	29.7185	30.9827	32.0151 (42b)
Hot water usage for other uses	45.2883	43.6414	41.9946	40.3477	38.7009	37.0540	37.0540	38.7009	40.3477	41.9946	43.6414	45.2883 (42c)
Average daily hot water use (litres/day)												139.5621 (43)
Daily hot water use	151.8260	148.5837	144.6355	138.6320	133.7567	128.5153	126.5013	130.4325	134.5785	140.0810	146.1770	151.4322 (44)
Energy conte	240.4552	211.5813	222.2993	189.7803	180.0622	158.0246	152.9923	161.5027	165.9488	190.0886	208.2559	237.1063 (45)
Energy content (annual)												Total = Sum(45)m = 2318.0973
Distribution loss (46)m = $0.15 \times (45)\text{m}$	36.0683	31.7372	33.3449	28.4670	27.0093	23.7037	22.9488	24.2254	24.8923	28.5133	31.2384	35.5659 (46)
Water storage loss (or HIU loss):												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8802 (55)
Total storage loss	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (56)
If cylinder contains dedicated solar storage	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (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	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549 (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	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549 (64)
12Total per year (kWh/year)												2913.2663 (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	120.3902	106.8762	114.3534	102.2363	100.3095	91.6776	91.3088	94.1385	94.3124	103.6433	108.3795	119.2767 (65)

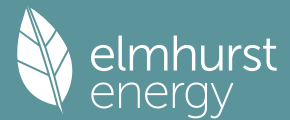
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	184.0950	203.8195	184.0950	190.2315	184.0950	190.2315	184.0950	184.0950	190.2315	184.0950	190.2315	184.0950 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.9890	368.7765	359.2322	338.9137	313.2652	289.1592	273.0549	269.2674	278.8117	299.1302	324.7787	348.8847 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684 (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)	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472 (71)
Water heating gains (Table 5)	161.8148	159.0420	153.7008	141.9949	134.8247	127.3300	122.7269	126.5303	130.9894	139.3056	150.5271	160.3182 (72)
Total internal gains	778.8041	799.5431	764.9333	739.0453	700.0900	674.6258	647.7820	647.7979	667.9378	690.4360	733.4425	761.2031 (73)

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
North	27.2400	10.6334	0.4500	0.7000	0.7700	63.2299 (74)
East	39.8600	19.6403	0.4500	0.7000	0.7700	170.8946 (76)

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South		7.6300		46.7521		0.4500		0.7000		0.7700		77.8698 (78)
West		25.6100		19.6403		0.4500		0.7000		0.7700		109.7996 (80)
North		0.8500		26.0000		0.7200		0.7000		1.0000		10.0246 (82)
East		0.8500		26.0000		0.7200		0.7000		1.0000		10.0246 (82)
South		0.8500		26.0000		0.7200		0.7000		1.0000		10.0246 (82)
West		0.8500		26.0000		0.7200		0.7000		1.0000		10.0246 (82)

Solar gains	461.8922	880.7447	1420.1210	2063.5990	2548.0199	2622.7629	2490.6548	2122.2286	1645.6508	1034.7310	571.1911	383.2146 (83)
Total gains	1240.6963	1680.2878	2185.0543	2802.6443	3248.1100	3297.3888	3138.4368	2770.0266	2313.5886	1725.1670	1304.6337	1144.4177 (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	56.9745	57.1002	57.2265	57.8663	57.9960	58.6532	58.6532	58.7865	58.3885	57.9960	57.7372	57.4807
alpha	4.7983	4.8067	4.8151	4.8578	4.8664	4.9102	4.9102	4.9191	4.8926	4.8664	4.8491	4.8320
util living area	0.9974	0.9890	0.9553	0.8331	0.6336	0.4429	0.3225	0.3801	0.6515	0.9364	0.9929	0.9982 (86)
Living	19.8236	20.0578	20.3888	20.7343	20.8907	20.9304	20.9358	20.9347	20.8993	20.6047	20.1343	19.7877
Non living	18.8289	19.0628	19.3857	19.7056	19.8270	19.8617	19.8639	19.8659	19.8424	19.6057	19.1491	18.8002
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	20.3982	20.0578	20.3888	20.7343	20.8907	20.9304	20.9358	20.9347	20.8993	20.6047	20.1343	19.9573 (87)
Th 2	19.8992	19.9014	19.9035	19.9143	19.9164	19.9272	19.9272	19.9294	19.9229	19.9164	19.9121	19.9078 (88)
util rest of house	0.9965	0.9854	0.9414	0.7924	0.5706	0.3708	0.2443	0.2927	0.5650	0.9097	0.9900	0.9976 (89)
MIT 2	19.3517	19.0628	19.3857	19.7056	19.8270	19.8617	19.8639	19.8659	19.8424	19.6057	19.1491	18.9552 (90)
Living area fraction	19.7114	19.4048	19.7305	20.0592	20.1926	20.2290	20.2324	20.2333	fLA = Living area / (4) =			0.3437 (91)
MIT	19.7114	19.4048	19.7305	20.0592	20.1926	20.2290	20.2324	20.2333	20.2057	19.9491	19.4877	19.2996 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7114	19.4048	19.7305	20.0592	20.1926	20.2290	20.2324	20.2333	20.2057	19.9491	19.4877	19.2996 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9833	0.9388	0.7983	0.5872	0.3913	0.2667	0.3177	0.5888	0.9106	0.9885	0.9972 (94)
Useful gains	1236.1182	1652.2921	2051.3420	2237.3001	1907.3112	1290.2155	836.8773	879.9820	1362.2562	1570.9651	1289.6287	1141.1632 (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	3659.4106	3436.5584	3127.7230	2608.8972	1981.0381	1298.3486	837.8151	882.1448	1414.6779	2180.8282	2902.5887	3553.8040 (97)
Space heating kWh	1802.9295	1199.0270	800.8274	267.5499	54.8528	0.0000	0.0000	0.0000	0.0000	453.7382	1161.3311	1795.0048 (98a)
Space heating requirement - total per year (kWh/year)												7535.2608
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	1802.9295	1199.0270	800.8274	267.5499	54.8528	0.0000	0.0000	0.0000	0.0000	453.7382	1161.3311	1795.0048 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7535.2608
Space heating per m2										(98c) / (4) =		38.9077 (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	2168.1287	1706.8247	1748.9820	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9687	0.9851	0.9731	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2100.3555	1681.4259	1701.9890	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	3702.6200	3523.5916	3104.1078	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	1153.6305	1370.5713	1043.1764	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			0.3150 (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	90.8394	107.9218	82.1420	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												280.9032 (107)

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 %)												291.8634 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)												3.8100 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1802.9295	1199.0270	800.8274	267.5499	54.8528	0.0000	0.0000	0.0000	0.0000	453.7382	1161.3311	1795.0048 (98)
Space heating efficiency (main heating system 1)	291.8634	291.8634	291.8634	291.8634	291.8634	0.0000	0.0000	0.0000	0.0000	291.8634	291.8634	291.8634 (210)
Space heating fuel (main heating system)	617.7305	410.8178	274.3843	91.6695	18.7940	0.0000	0.0000	0.0000	0.0000	155.4625	397.9022	615.0153 (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

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Efficiency of water heater	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549 (64)
(217)m	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397 (216)
Fuel for water heating, kWh/month	96.2824	85.1106	90.2753	78.9765	76.3006	68.4697	67.3442	70.1600	71.0915	79.6180	85.0894	95.1744 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	23.8424	28.3259	21.5596	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	131.4816	118.7576	131.4816	127.2402	131.4816	127.2402	131.4816	131.4816	127.2402	131.4816	127.2402	131.4816 (231)
Pumps and Fa	36.4938	29.2766	26.3604	19.3127	14.9177	12.1879	13.6084	17.6888	22.9760	30.1457	34.0495	37.5080 (232)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by PVs (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 (233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
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)
(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 (235a)
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)
(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 (235c)
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)
(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 (233b)
Electricity generated by PVs (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 (233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
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)
(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 (235b)
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)
(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 (235d)
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)
(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												2581.7762 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												302.2397
Water heating fuel used												963.8925 (219)
Space cooling fuel												73.7279 (221)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 2.4000)												
mechanical ventilation fans (SFP = 2.4000)												1548.0895 (230a)
Total electricity for the above, kWh/year												1548.0895 (231)
Electricity for lighting (calculated in Appendix L)												294.5255 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												5462.0117 (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	2581.7762	0.1570	405.4649 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	963.8925	0.1410	135.9018 (264)
Space and water heating			541.3667 (265)
Space cooling	73.7279	0.1142	8.4199 (266)
Pumps, fans and electric keep-hot	1548.0895	0.1387	214.7391 (267)
Energy for lighting	294.5255	0.1443	42.5091 (268)
Total CO2, kg/year			807.0349 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1700 (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	2581.7762	1.5814	4082.7046 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	963.8925	1.5213	1466.4125 (278)
Space and water heating			5549.1171 (279)
Space cooling	73.7279	1.4209	104.7601 (280)
Pumps, fans and electric keep-hot	1548.0895	1.5128	2341.9498 (281)
Energy for lighting	294.5255	1.5338	451.7531 (282)
Total Primary energy kWh/year			8447.5801 (286)
Dwelling Primary energy Rate (DPER)			43.6200 (287)

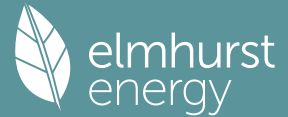
SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	193.6700		
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.6700		528.7191 (1b) - (3b)
Dwelling volume			528.7191 (4)
		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	528.7191 (5)

2. Ventilation rate

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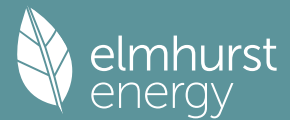


												m3 per hour	
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												4 * 10 =	40.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												40.0000 / (5) =	0.0757 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000 (17)	
Infiltration rate												0.3257 (18)	
Number of sides sheltered												2 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)	
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.2768 (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)
Adj infilt rate	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)
	0.3529	0.3460	0.3391	0.3045	0.2976	0.2630	0.2630	0.2560	0.2768	0.2976	0.3114	0.3252	(22b)
Effective ac	0.5623	0.5599	0.5575	0.5464	0.5443	0.5346	0.5346	0.5328	0.5383	0.5443	0.5485	0.5529	(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			3.6100	1.0000	3.6100		(26)
TER Opening Type			43.3500	1.1450	49.6374		(27)
TER Roof Light			1.4800	1.5918	2.9926		(27a)
Heatloss Floor 1			193.6700	0.1300	25.1771		(28a)
External Wall 1	227.5900	45.3000	182.2900	0.1800	32.8122		(29a)
sheltered to garage	18.4200	1.6600	16.7600	0.1800	3.0168		(29a)
flat ceiling	115.3500		115.3500	0.1100	12.6885		(30)
Roof sloping main	88.4000	1.4800	86.9200	0.1100	9.5612		(30)
roof slope bed 2 above ceiling	19.7200		19.7200	0.1100	2.1692		(30)
Total net area of external elements Aum(A, m2)			663.1500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	141.6651		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							251.4717 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				84.4200	0.1600	13.5072	
E5 Ground floor (normal)				7.2900	0.1600	1.1664	
E16 Corner (normal)				15.0000	0.0900	1.3500	
E17 Corner (inverted - internal area greater than external area)				20.0000	-0.0900	-1.8000	
E10 Eaves (insulation at ceiling level)				41.4000	0.0600	2.4840	
E12 Gable (insulation at ceiling level)				10.9400	0.0600	0.6564	
E11 Eaves (insulation at rafter level)				20.8600	0.0400	0.8344	
E13 Gable (insulation at rafter level)				16.3900	0.0800	1.3112	
R11 Upstands or kerbs of rooflights				21.1200	0.0800	1.6896	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.1992 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	162.8643 (37)

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Total heat required for water heating calculated for each month												
WWHRS	299.0840	264.5363	280.9281	246.5178	238.6910	214.7621	211.6211	220.1315	222.6863	248.7174	264.9934	295.7351 (62)
PV diverter	-34.0190	-30.0867	-31.5050	-26.0874	-24.3125	-20.8044	-19.5008	-20.7372	-21.5250	-25.3756	-28.7475	-33.3890 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	265.0650	234.4496	249.4231	220.4304	214.3785	193.9577	192.1203	199.3943	201.1613	223.3418	236.2459	262.3461 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2692.3142 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	126.8544	112.7148	120.8176	108.4920	106.7737	97.9332	97.7730	100.6027	100.5680	110.1075	114.6351	125.7409 (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	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	184.0950	203.8195	184.0950	190.2315	184.0950	190.2315	184.0950	184.0950	190.2315	184.0950	190.2315	184.0950 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	364.9890	368.7765	359.2322	338.9137	313.2652	289.1592	273.0549	269.2674	278.8117	299.1302	324.7787	348.8847 (68)
Pumps, fans	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472 (71)
Total internal gains	170.5032	167.7304	162.3892	150.6833	143.5131	136.0184	131.4153	135.2187	139.6778	147.9940	159.2155	169.0066 (72)
	790.4925	811.2315	776.6217	750.7337	711.7784	683.3143	656.4704	656.4863	676.6262	702.1244	745.1309	772.8915 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				11.7800	10.6334	0.6300	0.7000	0.7700	38.2815 (74)			
East				17.2200	19.6403	0.6300	0.7000	0.7700	103.3599 (76)			
South				3.3000	46.7521	0.6300	0.7000	0.7700	47.1505 (78)			
West				11.0500	19.6403	0.6300	0.7000	0.7700	66.3256 (80)			
North				0.3700	26.0000	0.6300	0.7000	1.0000	3.8182 (82)			
East				0.3700	26.0000	0.6300	0.7000	1.0000	3.8182 (82)			
South				0.3700	26.0000	0.6300	0.7000	1.0000	3.8182 (82)			
West				0.3700	26.0000	0.6300	0.7000	1.0000	3.8182 (82)			
Solar gains	270.3903	514.0396	825.7294	1196.2349	1474.7036	1517.1496	1441.0484	1229.2752	955.5587	603.0196	334.0772	224.5326 (83)
Total gains	1060.8828	1325.2711	1602.3510	1946.9686	2186.4821	2200.4638	2097.5189	1885.7615	1632.1849	1305.1440	1079.2081	997.4241 (84)

7. Mean internal temperature (heating season)

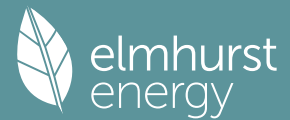
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	51.8394	51.9233	52.0059	52.3972	52.4710	52.8177	52.8177	52.8824	52.6836	52.4710	52.3218	52.1667
util living area	4.4560	4.4616	4.4671	4.4931	4.4981	4.5212	4.5212	4.5255	4.5122	4.4981	4.4881	4.4778
	0.9986	0.9960	0.9873	0.9514	0.8537	0.6825	0.5218	0.5941	0.8505	0.9795	0.9968	0.9990 (86)
MIT	19.2454	19.4703	19.8343	20.3218	20.7167	20.9265	20.9826	20.9698	20.7952	20.2516	19.6576	19.2100 (87)
Th 2	19.8038	19.8055	19.8072	19.8150	19.8164	19.8232	19.8232	19.8245	19.8206	19.8164	19.8135	19.8104 (88)
util rest of house	0.9981	0.9945	0.9825	0.9325	0.7997	0.5811	0.3901	0.4567	0.7730	0.9684	0.9955	0.9986 (89)
MIT 2	17.7650	18.0538	18.5181	19.1289	19.5809	19.7827	19.8181	19.8143	19.6786	19.0551	18.2998	17.7241 (90)
Living area fraction	18.2739	18.5407	18.9705	19.5389	19.9713	20.1759	20.2184	20.2115	20.0624	19.4663	18.7665	18.2348 (92)
MIT	18.2739	18.5407	18.9705	19.5389	19.9713	20.1759	20.2184	20.2115	20.0624	19.4663	18.7665	18.2348 (93)
Temperature adjustment												0.0000
adjusted MIT	18.2739	18.5407	18.9705	19.5389	19.9713	20.1759	20.2184	20.2115	20.0624	19.4663	18.7665	18.2348 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9971	0.9923	0.9779	0.9269	0.8078	0.6135	0.4356	0.5041	0.7915	0.9639	0.9936	0.9978 (94)
Ext temp.	1057.8108	1315.0328	1566.8797	1804.7359	1766.1527	1349.9897	913.7765	950.6248	1291.8280	1257.9719	1072.3084	995.2221 (95)
Heat loss rate W	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)
Space heating kWh	3646.7504	3554.0446	3244.0004	2746.8760	2132.5740	1428.1826	926.8019	975.0634	1531.0639	2285.9868	3016.5326	3639.6698 (97)
Space heating requirement - total per year (kWh/year)	1926.1711	1504.6159	1247.7778	678.3409	272.6174	0.0000	0.0000	0.0000	0.0000	764.8431	1399.8415	1967.4691 (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)	1926.1711	1504.6159	1247.7778	678.3409	272.6174	0.0000	0.0000	0.0000	0.0000	764.8431	1399.8415	1967.4691 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1926.1711	1504.6159	1247.7778	678.3409	272.6174	0.0000	0.0000	0.0000	0.0000	764.8431	1399.8415	1967.4691 (98c)
Space heating per m2												50.4037 (99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1926.1711	1504.6159	1247.7778	678.3409	272.6174	0.0000	0.0000	0.0000	0.0000	764.8431	1399.8415	1967.4691 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	2086.8592	1630.1364	1351.8719	734.9305	295.3602	0.0000	0.0000	0.0000	0.0000	828.6491	1516.6213	2131.6025 (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	265.0650	234.4496	249.4231	220.4304	214.3785	193.9577	192.1203	199.3943	201.1613	223.3418	236.2459	262.3461 (64)
Efficiency of water heater	87.6048	87.4701	87.1623	86.4098	84.5998	79.8000	79.8000	79.8000	79.8000	86.5927	87.3770	79.8000 (216)
Fuel for water heating, kWh/month	302.5690	268.0342	286.1593	255.0987	253.4029	243.0548	240.7523	249.8676	252.0818	257.9220	270.3753	299.3550 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	38.2513	30.6866	27.6299	20.2429	15.6362	12.7749	14.2638	18.5407	24.0825	31.5975	35.6893	39.3144 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-128.2211	-159.3412	-202.0973	-199.5299	-194.1745	-173.9424	-171.3445	-171.0340	-169.0993	-166.7892	-132.8347	-113.5065 (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	-155.3499	-311.4793	-593.1873	-856.3648	-1101.3509	-1096.0161	-1083.4217	-931.2931	-701.7542	-433.3315	-203.0581	-124.1034 (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												10576.0312 (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												3178.6729 (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)												308.7100 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-9572.6250 (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												4576.7892 (238)

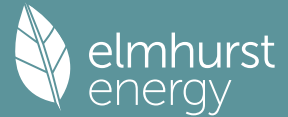
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	10576.0312	0.2100	2220.9666 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3178.6729	0.2100	667.5213 (264)
Space and water heating			2888.4879 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	308.7100	0.1443	44.5564 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1981.9146	0.1374	-272.4005
PV Unit electricity exported	-7590.7104	0.1271	-964.7562
Total			-1237.1567 (269)
Total CO2, kg/year			1707.8168 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8200 (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	10576.0312	1.1300	11950.9153 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3178.6729	1.1300	3591.9004 (278)
Space and water heating			15542.8157 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	308.7100	1.5338	473.5097 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1981.9146	1.5081	-2988.9620
PV Unit electricity exported	-7590.7104	0.4666	-3541.7015
Total			-6530.6635 (283)
Total Primary energy kWh/year			9615.7627 (286)
Target Primary Energy Rate (TPER)			49.6500 (287)

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	193.6700 (1b)	x 2.7300 (2b)	= 528.7191 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 528.7191 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	Air changes per hour 40.0000 / (5) = 0.0757 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.8200 (17)
Infiltration rate	0.2167 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1842 (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	0.2348	0.2302	0.2256	0.2026	0.1980	0.1749	0.1749	0.1703	0.1842	0.1980	0.2072	0.2164 (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	0.5276	0.5265	0.5254	0.5205	0.5196	0.5153	0.5153	0.5145	0.5170	0.5196	0.5215	0.5234 (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							
Front Door			1.9500	1.0000	1.9500		(26)
Windows			100.3400	0.8687	87.1680		(27)
Velux			3.4000	1.2357	4.2015		(27a)
Door to garage			1.6600	1.4000	2.3240		(26)
Heatloss Floor 1			193.6700	0.1100	21.3037	75.0000	14525.2500 (28a)
External Wall 1	227.5900	102.2900	125.3000	0.1200	15.0360	60.0000	7518.0000 (29a)
sheltered to garage	18.4200	1.6600	16.7600	0.9000	15.0840	115.0000	1927.4000 (29a)
flat ceiling	115.3500		115.3500	0.1000	11.5350	9.0000	1038.1500 (30)
Roof sloping main	88.4000	3.4000	85.0000	0.1300	11.0500	9.0000	765.0000 (30)
roof slope bed 2 above ceiling	19.7200		19.7200	0.1200	2.3664	9.0000	177.4800 (30)
Total net area of external elements Aum(A, m ²)			663.1500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		172.0186		(33)
Main dwelling			303.3500			75.0000	22751.2500 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 48702.5300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 251.4717 (35)

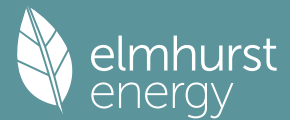
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	84.4200	0.0730	6.1627
E5 Ground floor (normal)	7.2900	0.3200	2.3328
E16 Corner (normal)	15.0000	0.0360	0.5400
E17 Corner (inverted - internal area greater than external area)	20.0000	-0.0640	-1.2800
E10 Eaves (insulation at ceiling level)	41.4000	0.0670	2.7738
E12 Gable (insulation at ceiling level)	10.9400	0.0530	0.5798
E11 Eaves (insulation at rafter level)	20.8600	0.0240	0.5006
E13 Gable (insulation at rafter level)	16.3900	0.0490	0.8031
R11 Upstands or kerbs of rooflights	21.1200	0.2400	5.0688
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			17.4816 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 189.5002 (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	92.0482	91.8614	91.6784	90.8185	90.6577	89.9088	89.9088	89.7701	90.1972	90.6577	90.9831	91.3233 (38)
Average = Sum(39)m / 12 =	281.5484	281.3616	281.1786	280.3187	280.1579	279.4090	279.4090	279.2703	279.6974	280.1579	280.4833	280.8235 (39)
												280.3180
HLP	1.4538	1.4528	1.4518	1.4474	1.4466	1.4427	1.4427	1.4420	1.4442	1.4466	1.4483	1.4500 (40)
HLP (average)												1.4474
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9937 (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	32.1237	31.6466	30.9748	29.7360	28.8085	27.7800	27.2244	27.8916	28.6179	29.7185	30.9827	32.0151 (42b)
Hot water usage for other uses	45.2883	43.6414	41.9946	40.3477	38.7009	37.0540	37.0540	38.7009	40.3477	41.9946	43.6414	45.2883 (42c)
Average daily hot water use (litres/day)												70.9549 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	77.4119	75.2880	72.9693	70.0838	67.5094	64.8340	64.2785	66.5924	68.9657	71.7131	74.6241	77.3033 (44)
Energy content (annual)	122.6016	107.2091	112.1512	95.9412	90.8806	79.7210	77.7392	82.4553	85.0416	97.3139	106.3158	121.0384 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											1178.4088
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	104.2114	91.1278	95.3285	81.5500	77.2485	67.7628	66.0783	70.0870	72.2853	82.7168	90.3684	102.8826 (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	104.2114	91.1278	95.3285	81.5500	77.2485	67.7628	66.0783	70.0870	72.2853	82.7168	90.3684	102.8826 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											1001.6475 (64)
Electric shower(s)	59.5932	53.0981	57.9810	55.3306	56.3689	53.7704	55.5628	56.3689	55.3306	57.9810	56.8908	1002 (64)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											677.8694 (64a)
Heat gains from water heating, kWh/month	40.9511	36.0565	38.3274	34.2201	33.4043	30.3833	30.4103	31.6140	31.9040	35.1745	36.8148	40.6190 (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	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839	149.6839
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	184.0950	203.8195	184.0950	190.2315	184.0950	190.2315	184.0950	184.0950	190.2315	184.0950	190.2315	184.0950
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.9890	368.7765	359.2322	338.9137	313.2652	289.1592	273.0549	269.2674	278.8117	299.1302	324.7787	348.8847
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684	37.9684
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)	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472
Water heating gains (Table 5)	55.0419	53.6554	51.5153	47.5280	44.8983	42.1990	40.8740	42.4919	44.3111	47.2775	51.1317	54.5954
Total internal gains	672.0311	694.1566	662.7477	644.5784	610.1637	589.4949	565.9291	563.7596	581.2595	598.4080	634.0471	655.4803

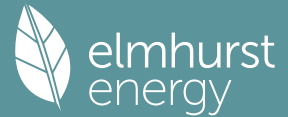
6. Solar gains

[Jan]												
				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a						factor	W
					W/m2						Table 6d	
North				27.2400	10.6334		0.4500		0.7000		0.7700	63.2299 (74)
East				39.8600	19.6403		0.4500		0.7000		0.7700	170.8946 (76)
South				7.6300	46.7521		0.4500		0.7000		0.7700	77.8698 (78)
West				25.6100	19.6403		0.4500		0.7000		0.7700	109.7996 (80)
North				0.8500	26.0000		0.7200		0.7000		1.0000	10.0246 (82)
East				0.8500	26.0000		0.7200		0.7000		1.0000	10.0246 (82)
South				0.8500	26.0000		0.7200		0.7000		1.0000	10.0246 (82)
West				0.8500	26.0000		0.7200		0.7000		1.0000	10.0246 (82)
Solar gains	461.8922	880.7447	1420.1210	2063.5990	2548.0199	2622.7629	2490.6548	2122.2286	1645.6508	1034.7310	571.1911	383.2146 (83)
Total gains	1133.9233	1574.9013	2082.8688	2708.1774	3158.1836	3212.2579	3056.5839	2685.9882	2226.9103	1633.1390	1205.2383	1038.6949 (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	48.0503	48.0822	48.1135	48.2611	48.2888	48.4182	48.4182	48.4422	48.3683	48.2888	48.2327	48.1743
alpha	4.2034	4.2055	4.2076	4.2174	4.2193	4.2279	4.2279	4.2295	4.2246	4.2193	4.2155	4.2116
util living area	0.9981	0.9923	0.9701	0.8871	0.7238	0.5349	0.3971	0.4670	0.7467	0.9598	0.9951	0.9987 (86)
MIT	19.1357	19.4503	19.9258	20.4828	20.8329	20.9634	20.9918	20.9842	20.8604	20.2962	19.5891	19.0769 (87)
Th 2	19.7224	19.7231	19.7238	19.7272	19.7278	19.7307	19.7307	19.7313	19.7296	19.7278	19.7265	19.7252 (88)
util rest of house	0.9974	0.9896	0.9596	0.8514	0.6532	0.4380	0.2852	0.3438	0.6498	0.9397	0.9930	0.9982 (89)
MIT 2	18.0455	18.3588	18.8256	19.3459	19.6304	19.7168	19.7291	19.7277	19.6629	19.1932	18.5010	17.9889 (90)
Living area fraction									fLA = Living area / (4) =			0.3437 (91)
MIT	18.4203	18.7340	19.2038	19.7367	20.0438	20.1453	20.1631	20.1596	20.0745	19.5723	18.8750	18.3628 (92)
Temperature adjustment												0.0000

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adjusted MIT 18.4203 18.7340 19.2038 19.7367 20.0438 20.1453 20.1631 20.1596 20.0745 19.5723 18.8750 18.3628 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9866	0.9541	0.8517	0.6719	0.4706	0.3238	0.3864	0.6787	0.9365	0.9909	0.9974	(94)
Useful gains	1129.7608	1553.8443	1987.3587	2306.5527	2122.1048	1511.8134	989.6961	1037.8125	1511.4632	1529.4843	1194.2575	1036.0055	(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	3975.5397	3892.3626	3572.0333	3037.7274	2337.5716	1549.4137	995.5638	1049.9376	1671.0571	2513.6700	3302.6874	3977.2562	(97)
Space heating kWh	2117.2595	1571.4843	1178.9979	526.4458	160.3073	0.0000	0.0000	0.0000	0.0000	732.2341	1518.0695	2188.2906	(98a)
Space heating requirement - total per year (kWh/year)												9993.0890	
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	2117.2595	1571.4843	1178.9979	526.4458	160.3073	0.0000	0.0000	0.0000	0.0000	732.2341	1518.0695	2188.2906	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9993.0890	
Space heating per m2										(98c) / (4) =		51.5985	(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	2626.4443	2067.6264	2122.4542	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9130	0.9503	0.9208	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2397.9668	1964.8971	1954.2640	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	3619.2082	3443.5962	3022.4840	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	879.2938	1100.1522	794.7557	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	219.8234	275.0380	198.6889	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												693.5504 (107)
Energy for space heating												51.5985 (99)
Energy for space cooling												3.5811 (108)
Total												55.1796 (109)
Fabric Energy Efficiency (DFEE)												55.2 (109)

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

1. Overall dwelling characteristics

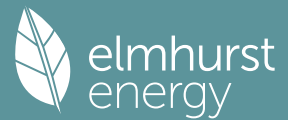
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	193.6700	2.7300	528.7191
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.6700		528.7191
Dwelling volume			528.7191

2. Ventilation rate

m3 per hour												
Number of open chimneys	0	* 80 =	0.0000	(6a)								
Number of open flues	0	* 20 =	0.0000	(6b)								
Number of chimneys / flues attached to closed fire	0	* 10 =	0.0000	(6c)								
Number of flues attached to solid fuel boiler	0	* 20 =	0.0000	(6d)								
Number of flues attached to other heater	0	* 35 =	0.0000	(6e)								
Number of blocked chimneys	0	* 20 =	0.0000	(6f)								
Number of intermittent extract fans	4	* 10 =	40.0000	(7a)								
Number of passive vents	0	* 10 =	0.0000	(7b)								
Number of flueless gas fires	0	* 40 =	0.0000	(7c)								
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											
Pressure test	40.0000 / (5) =											
Pressure Test Method	Yes											
Measured/design AP50	Blower Door											
Infiltration rate	5.0000 (17)											
Number of sides sheltered	0.3257 (18)											
	2 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] =											
Infiltration rate adjusted to include shelter factor	0.8500 (20)											
	(21) = (18) x (20) =											
	0.2768 (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
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
Adj infilt rate	0.3529	0.3460	0.3391	0.3045	0.2976	0.2630	0.2630	0.2560	0.2768	0.2976	0.3114	0.3252
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000
Effective ac	0.5623	0.5599	0.5575	0.5464	0.5443	0.5346	0.5346	0.5328	0.5383	0.5443	0.5485	0.5529

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			3.6100	1.0000	3.6100			(26)
TER Opening Type			43.3500	1.1450	49.6374			(27)
TER Roof Light			1.4800	1.5918	2.9926			(27a)
Heatloss Floor 1			193.6700	0.1300	25.1771			(28a)
External Wall 1	227.5900	45.3000	182.2900	0.1800	32.8122			(29a)
sheltered to garage	18.4200	1.6600	16.7600	0.1800	3.0168			(29a)
flat ceiling	115.3500		115.3500	0.1100	12.6885			(30)
Roof sloping main	88.4000	1.4800	86.9200	0.1100	9.5612			(30)
roof slope bed 2 above ceiling	19.7200		19.7200	0.1100	2.1692			(30)
Total net area of external elements Aum(A, m2)			663.1500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	141.6651		(33)

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

251.4717 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	84.4200	0.1600	13.5072
E5 Ground floor (normal)	7.2900	0.1600	1.1664
E16 Corner (normal)	15.0000	0.0900	1.3500
E17 Corner (inverted - internal area greater than external area)	20.0000	-0.0900	-1.8000
E10 Eaves (insulation at ceiling level)	41.4000	0.0600	2.4840
E12 Gable (insulation at ceiling level)	10.9400	0.0600	0.6564
E11 Eaves (insulation at rafter level)	20.8600	0.0400	0.8344
E13 Gable (insulation at rafter level)	16.3900	0.0800	1.3112
R11 Upstands or kerbs of rooflights	21.1200	0.0800	1.6896

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

21.1992 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 162.8643 (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	98.1049	97.6830	97.2694	95.3268	94.9633	93.2713	93.2713	92.9580	93.9230	94.9633	95.6986	96.4673	(38)
Average = Sum(39)m / 12 =	260.9692	260.5472	260.1336	258.1910	257.8275	256.1356	256.1356	255.8222	256.7873	257.8275	258.5628	259.3315	(39)

258.1893

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3475	1.3453	1.3432	1.3331	1.3313	1.3225	1.3225	1.3209	1.3259	1.3313	1.3351	1.3390	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

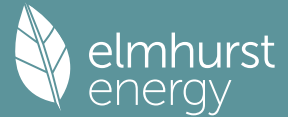
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9937 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use													
Energy conte													(44)
Energy content (annual)													(45)
Distribution loss (46)m = 0.15 x (45)m													(46)
Water storage loss (or HIU loss):													
Total storage loss													(56)
If cylinder contains dedicated solar storage													(57)
Primary loss													(59)
Combi loss													(61)
Total heat required for water heating calculated for each month													
WWHRS													(63a)
FV diverter													(63b)
Solar input													(63c)
FGHRS													(63d)
Output from w/h													
12Total per year (kWh/year)													(64)
Electric shower(s)													(64a)
Heat gains from water heating, kWh/month													(65)

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

Metabolic gains (Table 5), Watts													
(66)m													(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													(69)
Pumps, fans													(70)
Losses e.g. evaporation (negative values) (Table 5)													(71)
Water heating gains (Table 5)													

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Total internal gains	55.0419	53.6554	51.5153	47.5280	44.8983	42.1990	40.8740	42.4919	44.3111	47.2775	51.1317	54.5954 (72)
	672.0311	694.1566	662.7477	644.5784	610.1637	589.4949	565.9291	563.7596	581.2595	598.4080	634.0471	655.4803 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				11.7800	10.6334		0.6300		0.7000		0.7700		38.2815 (74)
East				17.2200	19.6403		0.6300		0.7000		0.7700		103.3599 (76)
South				3.3000	46.7521		0.6300		0.7000		0.7700		47.1505 (78)
West				11.0500	19.6403		0.6300		0.7000		0.7700		66.3256 (80)
North				0.3700	26.0000		0.6300		0.7000		1.0000		3.8182 (82)
East				0.3700	26.0000		0.6300		0.7000		1.0000		3.8182 (82)
South				0.3700	26.0000		0.6300		0.7000		1.0000		3.8182 (82)
West				0.3700	26.0000		0.6300		0.7000		1.0000		3.8182 (82)
Solar gains	270.3903	514.0396	825.7294	1196.2349	1474.7036	1517.1496	1441.0484	1229.2752	955.5587	603.0196	334.0772	224.5326	(83)
Total gains	942.4214	1208.1962	1488.4771	1840.8133	2084.8673	2106.6445	2006.9776	1793.0347	1536.8182	1201.4275	968.1243	880.0129	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.8394	51.9233	52.0059	52.3972	52.4710	52.8177	52.8177	52.8824	52.6836	52.4710	52.3218	52.1667
alpha	4.4560	4.4616	4.4671	4.4931	4.4981	4.5212	4.5212	4.5255	4.5122	4.4981	4.4881	4.4778
util living area	0.9991	0.9972	0.9904	0.9596	0.8703	0.7041	0.5426	0.6191	0.8716	0.9849	0.9980	0.9994 (86)
MIT	19.1827	19.4091	19.7769	20.2761	20.6889	20.9166	20.9797	20.9644	20.7692	20.2009	19.5992	19.1477 (87)
Th 2	19.8038	19.8055	19.8072	19.8150	19.8164	19.8232	19.8232	19.8245	19.8206	19.8164	19.8135	19.8104 (88)
util rest of house	0.9988	0.9962	0.9867	0.9434	0.8196	0.6027	0.4070	0.4786	0.7996	0.9764	0.9971	0.9992 (89)
MIT 2	18.1524	18.3795	18.7463	19.2382	19.6117	19.7868	19.8185	19.8149	19.6924	19.1747	18.5757	18.1223 (90)
Living area fraction	18.5066	18.7334	19.1006	19.5950	19.9819	20.1751	20.2177	20.2100	20.0625	19.5274	18.9275	18.4748 (92)
MIT	18.5066	18.7334	19.1006	19.5950	19.9819	20.1751	20.2177	20.2100	20.0625	19.5274	18.9275	18.4748 (93)
Temperature adjustment												0.0000
adjusted MIT	18.5066	18.7334	19.1006	19.5950	19.9819	20.1751	20.2177	20.2100	20.0625	19.5274	18.9275	18.4748 (93)

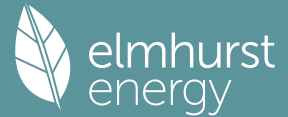
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9949	0.9837	0.9396	0.8278	0.6352	0.4540	0.5273	0.8171	0.9736	0.9961	0.9988 (94)
Useful gains	940.8490	1202.0567	1464.2567	1729.5962	1725.7687	1338.1888	911.2445	945.4874	1255.6679	1169.6997	964.3271	878.9341 (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	3707.4822	3604.2529	3277.8369	2761.3443	2135.3135	1427.9891	926.6100	974.6918	1531.1015	2301.7312	3058.1617	3701.8967 (97)
Space heating kWh	2058.3751	1614.2758	1349.3037	742.8586	304.7013	0.0000	0.0000	0.0000	0.0000	842.2314	1507.5609	2100.2842 (98a)
Space heating requirement - total per year (kWh/year)												10519.5910
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	2058.3751	1614.2758	1349.3037	742.8586	304.7013	0.0000	0.0000	0.0000	0.0000	842.2314	1507.5609	2100.2842 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10519.5910
Space heating per m2										(98c) / (4) =		54.3171 (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	2407.6742	1895.4031	1944.2489	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8104	0.8810	0.8312	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1951.2973	1669.9032	1616.0745	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2359.1738	2247.2513	2004.0813	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	293.6711	429.5470	288.6770	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	73.4178	107.3868	72.1693	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												252.9738 (107)
Energy for space heating												54.3171 (99)
Energy for space cooling												1.3062 (108)
Total												55.6233 (109)
Fabric Energy Efficiency (TFEE)												55.6 (109)

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1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	193.6700 (1b)	x 2.7300 (2b)	= 528.7191 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 528.7191 (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	0 * 10 = 0.0000 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8200	(17)
Infiltration rate		0.1410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1198	(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	0.1528	0.1498	0.1468	0.1318	0.1288	0.1139	0.1139	0.1109	0.1198	0.1288	0.1348	0.1408 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6000 (23c)
Effective ac	0.2748	0.2718	0.2688	0.2538	0.2508	0.2359	0.2359	0.2329	0.2418	0.2508	0.2568	0.2628 (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							
Front Door			1.9500	1.0000	1.9500		(26)
Windows			100.3400	0.8687	87.1680		(27)
Velux			3.4000	1.2357	4.2015		(27a)
Door to garage			1.6600	1.4000	2.3240		(26)
Heatloss Floor 1			193.6700	0.1100	21.3037	75.0000	14525.2500 (28a)
External Wall 1	227.5900	102.2900	125.3000	0.1200	15.0360	60.0000	7518.0000 (29a)
sheltered to garage	18.4200	1.6600	16.7600	0.9000	15.0840	115.0000	1927.4000 (29a)
flat ceiling	115.3500		115.3500	0.1000	11.5350	9.0000	1038.1500 (30)
Roof sloping main	88.4000	3.4000	85.0000	0.1300	11.0500	9.0000	765.0000 (30)
roof slope bed 2 above ceiling	19.7200		19.7200	0.1200	2.3664	9.0000	177.4800 (30)
Total net area of external elements Aum(A, m ²)			663.1500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	172.0186		(33)
Main dwelling							
Internal Wall 1			303.3500			75.0000	22751.2500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	48702.5300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		251.4717 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	84.4200	0.0730	6.1627
E5 Ground floor (normal)	7.2900	0.3200	2.3328
E16 Corner (normal)	15.0000	0.0360	0.5400
E17 Corner (inverted - internal area greater than external area)	20.0000	-0.0640	-1.2800
E10 Eaves (insulation at ceiling level)	41.4000	0.0670	2.7738
E12 Gable (insulation at ceiling level)	10.9400	0.0530	0.5798
E11 Eaves (insulation at rafter level)	20.8600	0.0240	0.5006
E13 Gable (insulation at rafter level)	16.3900	0.0490	0.8031
R11 Upstands or kerbs of rooflights	21.1200	0.2400	5.0688

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.4816 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	189.5002 (37)

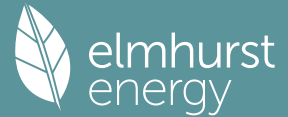
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.9479	47.4251	46.9023	44.2884	43.7657	41.1518	41.1518	40.6290	42.1973	43.7657	44.8112	45.8568 (38)
Average = Sum(39)m / 12 =	237.4481	236.9253	236.4025	233.7887	233.2659	230.6520	230.6520	230.1292	231.6975	233.2659	234.3114	235.3570 (39)
												233.6580

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2260	1.2233	1.2206	1.2071	1.2045	1.1910	1.1910	1.1883	1.1964	1.2045	1.2098	1.2152 (40)
HLP (average)												1.2065
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9937 (42)
Hot water usage for mixer showers	

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Hot water usage for baths	74.4140	73.2957	71.6661	68.5482	66.2473	63.6813	62.2228	63.8400	65.6129	68.3679	71.5528	74.1289 (42a)
Hot water usage for other uses	32.1237	31.6466	30.9748	29.7360	28.8085	27.7800	27.2244	27.8916	28.6179	29.7185	30.9827	32.0151 (42b)
Average daily hot water use (litres/day)	45.2883	43.6414	41.9946	40.3477	38.7009	37.0540	37.0540	38.7009	40.3477	41.9946	43.6414	45.2883 (42c)
												139.5621 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	151.8260	148.5837	144.6355	138.6320	133.7567	128.5153	126.5013	130.4325	134.5785	140.0810	146.1770	151.4322 (44)
Distribution loss (46)m = 0.15 x (45)m	240.4552	211.5813	222.2993	189.7803	180.0622	158.0246	152.9923	161.5027	165.9488	190.0886	208.2559	237.1063 (45)
Water storage loss (or HIU loss):	36.0683	31.7372	33.3449	28.4670	27.0093	23.7037	22.9488	24.2254	24.8923	28.5133	31.2384	35.5659 (46)
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8802 (55)
Total storage loss	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (56)
If cylinder contains dedicated solar storage	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (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	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549 (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	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549 (64)
												Total per year (kWh/year) = Sum(64)m = 2913.2663 (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	120.3902	106.8762	114.3534	102.2363	100.3095	91.6776	91.3088	94.1385	94.3124	103.6433	108.3795	119.2767 (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	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.6931	37.0315	30.1160	22.7998	17.0431	14.3885	15.5473	20.2089	27.1244	34.4407	40.1973	42.8519 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	544.7597	550.4126	536.1675	505.8413	467.5599	431.5808	407.5446	401.8917	416.1368	446.4630	484.7444	520.7235 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558 (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)	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472 (71)
Water heating gains (Table 5)	161.8148	159.0420	153.7008	141.9949	134.8247	127.3300	122.7269	126.5303	130.9894	139.3056	150.5271	160.3182 (72)
Total internal gains	864.0970	862.3154	835.8137	786.4653	735.2570	689.1286	661.6481	664.4602	690.0799	736.0385	791.2981	839.7229 (73)

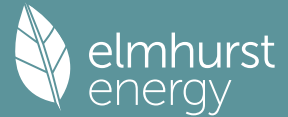
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					27.2400	10.6334		0.4500	0.7000	0.7700		63.2299 (74)	
East					39.8600	19.6403		0.4500	0.7000	0.7700		170.8946 (76)	
South					7.6300	46.7521		0.4500	0.7000	0.7700		77.8698 (78)	
West					25.6100	19.6403		0.4500	0.7000	0.7700		109.7996 (80)	
North					0.8500	26.0000		0.7200	0.7000	1.0000		10.0246 (82)	
East					0.8500	26.0000		0.7200	0.7000	1.0000		10.0246 (82)	
South					0.8500	26.0000		0.7200	0.7000	1.0000		10.0246 (82)	
West					0.8500	26.0000		0.7200	0.7000	1.0000		10.0246 (82)	
Solar gains	461.8922	880.7447	1420.1210	2063.5990	2548.0199	2622.7629	2490.6548	2122.2286	1645.6508	1034.7310	571.1911	383.2146 (83)	
Total gains	1325.9892	1743.0601	2255.9347	2850.0643	3283.2769	3311.8915	3152.3029	2786.6889	2335.7308	1770.7696	1362.4892	1222.9375 (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	56.9745	57.1002	57.2265	57.8663	57.9960	58.6532	58.6532	58.7865	58.3885	57.9960	57.7372	57.4807
alpha	4.7983	4.8067	4.8151	4.8578	4.8664	4.9102	4.9102	4.9191	4.8926	4.8664	4.8491	4.8320
util living area	0.9965	0.9873	0.9500	0.8262	0.6280	0.4410	0.3211	0.3779	0.6466	0.9307	0.9914	0.9976 (86)
Living	19.8578	20.0819	20.4116	20.7423	20.8924	20.9305	20.9358	20.9347	20.9005	20.6181	20.1570	19.8194
Non living	18.8629	19.0864	19.4069	19.7120	19.8280	19.8617	19.8639	19.8659	19.8430	19.6173	19.1714	18.8318
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	20.4157	20.0819	20.4116	20.7423	20.8924	20.9305	20.9358	20.9347	20.9005	20.6181	20.1570	19.8846 (87)
Th 2	19.8992	19.9014	19.9035	19.9143	19.9164	19.9272	19.9272	19.9294	19.9229	19.9164	19.9121	19.9078 (88)
util rest of house	0.9953	0.9831	0.9349	0.7847	0.5653	0.3692	0.2433	0.2910	0.5603	0.9022	0.9880	0.9968 (89)
MIT 2	19.3691	19.0864	19.4069	19.7120	19.8280	19.8617	19.8639	19.8659	19.8430	19.6173	19.1714	18.9823 (90)
Living area fraction	19.7288	19.4286	19.7522	20.0662	20.1939	20.2291	20.2324	20.2333	20.2065	19.9613	19.5102	0.3437 (91)
MIT	19.7288	19.4286	19.7522	20.0662	20.1939	20.2291	20.2324	20.2333	20.2065	19.9613	19.5102	19.3268 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7288	19.4286	19.7522	20.0662	20.1939	20.2291	20.2324	20.2333	20.2065	19.9613	19.5102	19.3268 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9951	0.9809	0.9324	0.7910	0.5819	0.3896	0.2655	0.3158	0.5841	0.9036	0.9864	0.9962	(94)
Useful gains	1319.5206	1709.7438	2103.4320	2254.2737	1910.3974	1290.3830	836.8983	880.0461	1364.2137	1600.1296	1343.9348	1218.3341	(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	3663.5506	3442.1885	3132.8637	2610.5243	1981.3275	1298.3650	837.8176	882.1519	1414.8653	2183.6736	2907.8492	3560.2067	(97)
Space heating kWh	1743.9583	1164.2028	765.8972	256.5005	52.7720	0.0000	0.0000	0.0000	0.0000	434.1568	1126.0184	1742.3532	(98a)
Space heating requirement - total per year (kWh/year)												7285.8592	
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	1743.9583	1164.2028	765.8972	256.5005	52.7720	0.0000	0.0000	0.0000	0.0000	434.1568	1126.0184	1742.3532	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7285.8592	
Space heating per m2										(98c) / (4) =		37.6200	(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	2168.1287	1706.8247	1748.9820	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9687	0.9851	0.9731	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2100.3555	1681.4259	1701.9890	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	3702.6200	3523.5916	3104.1078	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1153.6305	1370.5713	1043.1764	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			0.3150	(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	90.8394	107.9218	82.1420	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												280.9032	(107)

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 %)													291.8634	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)													3.8100	(209)
Space heating requirement	1743.9583	1164.2028	765.8972	256.5005	52.7720	0.0000	0.0000	0.0000	0.0000	434.1568	1126.0184	1742.3532	(98)	
Space heating efficiency (main heating system 1)	291.8634	291.8634	291.8634	291.8634	291.8634	0.0000	0.0000	0.0000	0.0000	291.8634	291.8634	291.8634	(210)	
Space heating fuel (main heating system)	597.5255	398.8862	262.4163	87.8837	18.0811	0.0000	0.0000	0.0000	0.0000	148.7534	385.8032	596.9755	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549	(64)	
Efficiency of water heater	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	(216)	
Fuel for water heating, kWh/month	96.2824	85.1106	90.2753	78.9765	76.3006	68.4697	67.3442	70.1600	71.0915	79.6180	85.0894	95.1744	(219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	23.8424	28.3259	21.5596	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	131.4816	118.7576	131.4816	127.2402	131.4816	127.2402	131.4816	131.4816	127.2402	131.4816	127.2402	131.4816	(231)	
Lighting	36.4938	29.2766	26.3604	19.3127	14.9177	12.1879	13.6084	17.6888	22.9760	30.1457	34.0495	37.5080	(232)	
Electricity generated by PVs (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	(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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												2496.3248	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												302.2397		
Water heating fuel used												963.8925	(219)	
Space cooling fuel												73.7279	(221)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 2.4000)														
mechanical ventilation fans (SFP = 2.4000)													1548.0895	(230a)
Total electricity for the above, kWh/year													1548.0895	(231)
Electricity for lighting (calculated in Appendix L)													294.5255	(232)

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Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5376.5602 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2496.3248	16.4900	411.6440 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	963.8925	16.4900	158.9459 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Space cooling	73.7279	16.4900	12.1577 (248)
Pumps, fans and electric keep-hot	1548.0895	16.4900	255.2800 (249)
Energy for lighting	294.5255	16.4900	48.5673 (250)
Additional standing charges			0.0000 (251)
Total energy cost			886.5948 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3373 (257)
SAP value		78.3223
SAP rating (Section 12)		78 (258)
SAP band		C

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	2496.3248	0.1571	392.1159 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	963.8925	0.1410	135.9018 (264)
Space and water heating			528.0177 (265)
Space cooling	73.7279	0.1142	8.4199 (266)
Pumps, fans and electric keep-hot	1548.0895	0.1387	214.7391 (267)
Energy for lighting	294.5255	0.1443	42.5091 (268)
Total CO2, kg/year			793.6859 (272)
CO2 emissions per m2			4.1000 (273)
EI value			95.5439
EI rating			96 (274)
EI band			A

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

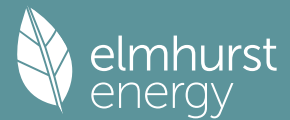
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	193.6700 (1b)	x 2.7300 (2b)	= 528.7191 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	528.7191 (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	0 * 10 = 0.0000 (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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.8200 (17)
Infiltration rate	0.1410 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1198 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.0000	4.6000	4.4000	4.2000	4.4000	3.9000	4.1000	3.9000	4.0000	4.3000	4.3000	4.5000	(22)
Adj infilt rate	1.2500	1.1500	1.1000	1.0500	1.1000	0.9750	1.0250	0.9750	1.0000	1.0750	1.0750	1.1250	(22a)
	0.1498	0.1378	0.1318	0.1258	0.1318	0.1169	0.1228	0.1169	0.1198	0.1288	0.1288	0.1348	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													75.6000 (23c)
Effective ac	0.2718	0.2598	0.2538	0.2478	0.2538	0.2389	0.2448	0.2389	0.2418	0.2508	0.2508	0.2568	(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								
Front Door			1.9500	1.0000	1.9500			(26)
Windows			100.3400	0.8687	87.1680			(27)
Velux			3.4000	1.2357	4.2015			(27a)
Door to garage			1.6600	1.4000	2.3240			(26)
Heatloss Floor 1			193.6700	0.1100	21.3037	75.0000	14525.2500	(28a)
External Wall 1	227.5900	102.2900	125.3000	0.1200	15.0360	60.0000	7518.0000	(29a)
sheltered to garage	18.4200	1.6600	16.7600	0.9000	15.0840	115.0000	1927.4000	(29a)
flat ceiling	115.3500		115.3500	0.1000	11.5350	9.0000	1038.1500	(30)
Roof sloping main	88.4000	3.4000	85.0000	0.1300	11.0500	9.0000	765.0000	(30)
roof slope bed 2 above ceiling	19.7200		19.7200	0.1200	2.3664	9.0000	177.4800	(30)
Total net area of external elements Aum(A, m2)			663.1500					(31)
Fabric heat loss, W/K = Sum (A x U)					172.0186			(33)
Main dwelling								
Internal Wall 1			303.3500			75.0000	22751.2500	(32c)

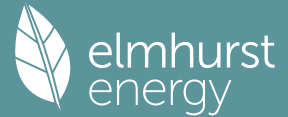
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	48702.5300 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		251.4717 (35)	
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	84.4200	0.0730	6.1627
E5 Ground floor (normal)	7.2900	0.3200	2.3328
E16 Corner (normal)	15.0000	0.0360	0.5400
E17 Corner (inverted - internal area greater than external area)	20.0000	-0.0640	-1.2800
E10 Eaves (insulation at ceiling level)	41.4000	0.0670	2.7738
E12 Gable (insulation at ceiling level)	10.9400	0.0530	0.5798
E11 Eaves (insulation at rafter level)	20.8600	0.0240	0.5006
E13 Gable (insulation at rafter level)	16.3900	0.0490	0.8031
R11 Upstands or kerbs of rooflights	21.1200	0.2400	5.0688
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			17.4816 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		189.5002 (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	47.4251	45.3340	44.2884	43.2429	44.2884	41.6746	42.7201	41.6746	42.1973	43.7657	43.7657	44.8112	(38)
Average = Sum(39)m / 12 =	236.9253	234.8342	233.7887	232.7431	233.7887	231.1748	232.2203	231.1748	231.6975	233.2659	233.2659	234.3114	(39)
												233.2659	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2233	1.2125	1.2071	1.2018	1.2071	1.1937	1.1991	1.1937	1.1964	1.2045	1.2045	1.2098	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9937 (42)
Hot water usage for mixer showers													
	74.4140	73.2957	71.6661	68.5482	66.2473	63.6813	62.2228	63.8400	65.6129	68.3679	71.5528	74.1289	(42a)
Hot water usage for baths													
	32.1237	31.6466	30.9748	29.7360	28.8085	27.7800	27.2244	27.8916	28.6179	29.7185	30.9827	32.0151	(42b)
Hot water usage for other uses													
	45.2883	43.6414	41.9946	40.3477	38.7009	37.0540	37.0540	38.7009	40.3477	41.9946	43.6414	45.2883	(42c)
Average daily hot water use (litres/day)													139.5621 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	151.8260	148.5837	144.6355	138.6320	133.7567	128.5153	126.5013	130.4325	134.5785	140.0810	146.1770	151.4322	(44)
Energy conte	240.4552	211.5813	222.2993	189.7803	180.0622	158.0246	152.9923	161.5027	165.9488	190.0886	208.2559	237.1063	(45)
Energy content (annual)													Total = Sum(45)m = 2318.0973
Distribution loss (46)m = 0.15 x (45)m													
	36.0683	31.7372	33.3449	28.4670	27.0093	23.7037	22.9488	24.2254	24.8923	28.5133	31.2384	35.5659	(46)
Water storage loss (or HIU loss):													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6300 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8802 (55)
Total storage loss													
	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862	(56)
If cylinder contains dedicated solar storage													
	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862	(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													
	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549	(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													
	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549	(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													
	120.3902	106.8762	114.3534	102.2363	100.3095	91.6776	91.3088	94.1385	94.3124	103.6433	108.3795	119.2767	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.6931	37.0315	30.1160	22.7998	17.0431	14.3885	15.5473	20.2089	27.1244	34.4407	40.1973	42.8519 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	544.7597	550.4126	536.1675	505.8413	467.5599	431.5808	407.5446	401.8917	416.1368	446.4630	484.7444	520.7235 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558 (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)	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472 (71)
Water heating gains (Table 5)	161.8148	159.0420	153.7008	141.9949	134.8247	127.3300	122.7269	126.5303	130.9894	139.3056	150.5271	160.3182 (72)
Total internal gains	864.0970	862.3154	835.8137	786.4653	735.2570	689.1286	661.6481	664.4602	690.0799	736.0385	791.2981	839.7229 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					27.2400	14.6401	0.4500	0.7000	0.7700	87.0551 (74)		
East					39.8600	27.3735	0.4500	0.7000	0.7700	238.1831 (76)		
South					7.6300	61.3950	0.4500	0.7000	0.7700	102.2589 (78)		
West					25.6100	27.3735	0.4500	0.7000	0.7700	153.0323 (80)		
North					0.8500	37.0000	0.7200	0.7000	1.0000	14.2657 (82)		
East					0.8500	37.0000	0.7200	0.7000	1.0000	14.2657 (82)		
South					0.8500	37.0000	0.7200	0.7000	1.0000	14.2657 (82)		
West					0.8500	37.0000	0.7200	0.7000	1.0000	14.2657 (82)		
Solar gains	637.5923	1016.6053	1638.9837	2459.0891	2936.3298	3232.7445	3049.7464	2608.7283	2026.4856	1270.3511	756.3396	512.8301 (83)
Total gains	1501.6893	1878.9207	2474.7974	3245.5544	3671.5868	3921.8731	3711.3946	3273.1886	2716.5656	2006.3896	1547.6377	1352.5530 (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	57.1002	57.6086	57.8663	58.1262	57.8663	58.5206	58.2571	58.5206	58.3885	57.9960	57.9960	57.7372
alpha	4.8067	4.8406	4.8578	4.8751	4.8578	4.9014	4.8838	4.9014	4.8926	4.8664	4.8664	4.8491
util living area	0.9919	0.9783	0.9128	0.7237	0.5055	0.3117	0.2126	0.2259	0.4708	0.8389	0.9765	0.9945 (86)
Living	20.0455	20.2287	20.5693	20.8404	20.9209	20.9357	20.9365	20.9367	20.9291	20.7851	20.3808	20.0205
Non living	19.0513	19.2377	19.5624	19.7925	19.8431	19.8616	19.8573	19.8619	19.8571	19.7580	19.3944	19.0358
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	20.5117	20.2287	20.5693	20.8404	20.9209	20.9357	20.9365	20.9367	20.9291	20.7851	20.3808	20.1576 (87)
Th 2	19.9014	19.9100	19.9143	19.9186	19.9143	19.9251	19.9208	19.9251	19.9229	19.9164	19.9164	19.9121 (88)
util rest of house	0.9891	0.9712	0.8881	0.6713	0.4417	0.2488	0.1452	0.1501	0.3835	0.7816	0.9667	0.9924 (89)
MIT 2	19.4665	19.2377	19.5624	19.7925	19.8431	19.8616	19.8573	19.8619	19.8571	19.7580	19.3944	19.1583 (90)
Living area fraction									fLA = Living area / (4) =			0.3437 (91)
MIT	19.8258	19.5783	19.9085	20.1527	20.2136	20.2308	20.2283	20.2313	20.2256	20.1110	19.7335	19.5018 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8258	19.5783	19.9085	20.1527	20.2136	20.2308	20.2283	20.2313	20.2256	20.1110	19.7335	19.5018 (93)

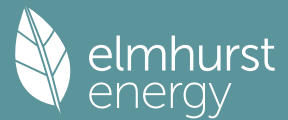
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9888	0.9685	0.8879	0.6832	0.4595	0.2668	0.1644	0.1717	0.4084	0.7931	0.9647	0.9915 (94)
Useful gains	1484.9235	1819.7143	2197.4008	2217.4859	1687.2630	1046.2104	610.2606	561.9759	1109.4868	1591.2246	1492.9507	1340.9974 (95)
Ext temp.	5.5000	5.8000	7.5000	9.9000	12.9000	15.7000	17.6000	17.8000	15.4000	12.2000	8.7000	5.7000 (96)
Heat loss rate W	3394.1348	3235.6274	2900.9690	2386.2433	1709.8270	1047.3989	610.3363	562.0586	1118.0803	1845.3749	2573.7341	3233.9189 (97)
Space heating kWh	1420.4532	951.4936	523.4548	121.5053	16.7876	0.0000	0.0000	0.0000	0.0000	189.0878	778.1640	1408.3336 (98a)
Space heating requirement - total per year (kWh/year)												5409.2799
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	1420.4532	951.4936	523.4548	121.5053	16.7876	0.0000	0.0000	0.0000	0.0000	189.0878	778.1640	1408.3336 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5409.2799
Space heating per m2										(98c) / (4) =		27.9304 (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.	5.5000	5.8000	7.5000	9.9000	12.9000	15.7000	17.6000	17.8000	15.4000	12.2000	8.7000	5.7000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	1918.7505	1486.2100	1433.2835	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9903	0.9958	0.9939	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1900.1469	1479.9660	1424.4689	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4403.0874	4165.6187	3662.8495	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	1802.1171	1998.1256	1665.3551	0.0000	0.0000	0.0000	0.0000 (104)

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Cooled fraction	FC = cooled area / (4) =										0.3150 (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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	141.9026	157.3368	131.1337	0.0000	0.0000	0.0000 (107)
Space cooling requirement											430.3731 (107)

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 %)												291.8269 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)												3.8100 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1420.4532	951.4936	523.4548	121.5053	16.7876	0.0000	0.0000	0.0000	0.0000	189.0878	778.1640	1408.3336 (98)
Space heating efficiency (main heating system 1)	291.8269	291.8269	291.8269	291.8269	291.8269	0.0000	0.0000	0.0000	0.0000	291.8269	291.8269	291.8269 (210)
Space heating fuel (main heating system)	486.7452	326.0473	179.3717	41.6361	5.7526	0.0000	0.0000	0.0000	0.0000	64.7945	266.6526	482.5921 (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	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549 (64)
Efficiency of water heater (217)m	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382 (216)
Fuel for water heating, kWh/month	96.2829	85.1110	90.2758	78.9769	76.3010	68.4700	67.3445	70.1603	71.0919	79.6184	85.0898	95.1749 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	37.2448	41.2957	34.4183	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	131.4816	118.7576	131.4816	127.2402	131.4816	127.2402	131.4816	131.4816	127.2402	131.4816	127.2402	131.4816 (231)
Lighting	36.4938	29.2766	26.3604	19.3127	14.9177	12.1879	13.6084	17.6888	22.9760	30.1457	34.0495	37.5080 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1853.5920 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												302.2382
Water heating fuel used												963.8974 (219)
Space cooling fuel												112.9588 (221)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 2.4000)												
mechanical ventilation fans (SFP = 2.4000)												
Total electricity for the above, kWh/year												
Electricity for lighting (calculated in Appendix L)												

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												
Wind generation												
Hydro-electric generation (Appendix N)												
Electricity generated - Micro CHP (Appendix N)												
Appendix Q - special features												
Energy saved or generated												
Energy used												
Total delivered energy for all uses												

10a. Fuel costs - using BEDF prices (589)

	Fuel	Fuel price	Fuel cost	
	kWh/year	p/kWh	£/year	
Space heating - main system 1	1853.5920	28.4300	526.9762 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	963.8974	28.4300	274.0360 (247)	
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)	
Space cooling	112.9588	28.4300	32.1142 (248)	
Pumps, fans and electric keep-hot	1548.0895	28.4300	440.1219 (249)	
Energy for lighting	294.5255	28.4300	83.7336 (250)	
Additional standing charges			0.0000 (251)	
Total energy cost			1356.9819 (255)	

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

	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	1853.5920	0.1583	293.4033 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	963.8974	0.1410	135.9025 (264)	

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Space and water heating			429.3058 (265)
Space cooling	112.9588	0.1143	12.9081 (266)
Pumps, fans and electric keep-hot	1548.0895	0.1387	214.7391 (267)
Energy for lighting	294.5255	0.1443	42.5091 (268)
Total CO2, kg/year			699.4621 (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	1853.5920	1.5859	2939.6446 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	963.8974	1.5213	1466.4199 (278)
Space and water heating			4406.0646 (279)
Space cooling	112.9588	1.4211	160.5298 (280)
Pumps, fans and electric keep-hot	1548.0895	1.5128	2341.9498 (281)
Energy for lighting	294.5255	1.5338	451.7531 (282)
Total Primary energy kWh/year			7360.2973 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating:	C 78
Current environmental impact rating:	A 96

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

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 5.1	-£ 385	-269 kg (38.4%)

Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.6	-£ 61	-27 kg (3.8%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar photovoltaic panels	£385	1.39 kg/m²	B 83 A 97
Total Savings	£385	1.39 kg/m²	

Potential energy efficiency rating:	B 83
Potential environmental impact rating:	A 97

Fuel prices for cost data on this page from database revision number 589 TEST (12 Dec 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£1357	£1357	£0
Space heating	£967	£967	£0
Space cooling	£32	£32	£0
Water heating	£274	£274	£0
Lighting	£84	£84	£0
Generated (PV)	-£0	-£385	£385
Total cost of fuels	£1357	£972	£385
Total cost of uses	£1357	£972	£385
Delivered energy	25 kWh/m²	14 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.4 tonnes	0.3 tonnes
CO2 emissions per m²	4 kg/m²	2 kg/m²	1 kg/m²
Primary energy	38 kWh/m²	27 kWh/m²	11 kWh/m²

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

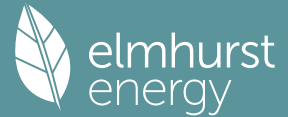
1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling	193.6700 (1b)	x 2.7300 (2b)	= 528.7191 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.6700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 528.7191 (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)

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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 0 * 10 = 0.0000 (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) = 0.0000 / (5) = 0.0000 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 2.8200 (17)
Infiltration rate 0.1410 (18)
Number of sides sheltered 2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1198 (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													
	0.1528	0.1498	0.1468	0.1318	0.1288	0.1139	0.1139	0.1109	0.1198	0.1288	0.1348	0.1408	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													75.6000 (23c)
Effective ac	0.2748	0.2718	0.2688	0.2538	0.2508	0.2359	0.2359	0.2329	0.2418	0.2508	0.2568	0.2628	(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							
Front Door			1.9500	1.0000	1.9500		(26)
Windows			100.3400	0.8687	87.1680		(27)
Velux			3.4000	1.2357	4.2015		(27a)
Door to garage			1.6600	1.4000	2.3240		(26)
Heatloss Floor 1			193.6700	0.1100	21.3037	75.0000	14525.2500 (28a)
External Wall 1	227.5900	102.2900	125.3000	0.1200	15.0360	60.0000	7518.0000 (29a)
sheltered to garage	18.4200	1.6600	16.7600	0.9000	15.0840	115.0000	1927.4000 (29a)
flat ceiling	115.3500		115.3500	0.1000	11.5350	9.0000	1038.1500 (30)
Roof sloping main	88.4000	3.4000	85.0000	0.1300	11.0500	9.0000	765.0000 (30)
roof slope bed 2 above ceiling	19.7200		19.7200	0.1200	2.3664	9.0000	177.4800 (30)
Total net area of external elements Aum(A, m2)			663.1500				(31)
Fabric heat loss, W/K = Sum (A x U)					172.0186		(33)
Main dwelling							
Internal Wall 1			303.3500			75.0000	22751.2500 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 48702.5300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 251.4717 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	84.4200	0.0730	6.1627
E5 Ground floor (normal)	7.2900	0.3200	2.3328
E16 Corner (normal)	15.0000	0.0360	0.5400
E17 Corner (inverted - internal area greater than external area)	20.0000	-0.0640	-1.2800
E10 Eaves (insulation at ceiling level)	41.4000	0.0670	2.7738
E12 Gable (insulation at ceiling level)	10.9400	0.0530	0.5798
E11 Eaves (insulation at rafter level)	20.8600	0.0240	0.5006
E13 Gable (insulation at rafter level)	16.3900	0.0490	0.8031
R11 Upstands or kerbs of rooflights	21.1200	0.2400	5.0688

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.4816 (36)
Point Thermal Bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 189.5002 (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	47.9479	47.4251	46.9023	44.2884	43.7657	41.1518	41.1518	40.6290	42.1973	43.7657	44.8112	45.8568	(38)
Heat transfer coeff	237.4481	236.9253	236.4025	233.7887	233.2659	230.6520	230.6520	230.1292	231.6975	233.2659	234.3114	235.3570	(39)
Average = Sum(39)m / 12 =												233.6580	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2260	1.2233	1.2206	1.2071	1.2045	1.1910	1.1910	1.1883	1.1964	1.2045	1.2098	1.2152	(40)
HLP (average)												1.2065	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9937 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	74.4140	73.2957	71.6661	68.5482	66.2473	63.6813	62.2228	63.8400	65.6129	68.3679	71.5528	74.1289	(42a)

Hot water usage for baths

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	32.1237	31.6466	30.9748	29.7360	28.8085	27.7800	27.2244	27.8916	28.6179	29.7185	30.9827	32.0151	(42b)

Hot water usage for other uses

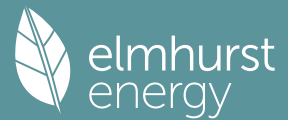
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	45.2883	43.6414	41.9946	40.3477	38.7009	37.0540	37.0540	38.7009	40.3477	41.9946	43.6414	45.2883	(42c)

Average daily hot water use (litres/day) 139.5621 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.8260	148.5837	144.6355	138.6320	133.7567	128.5153	126.5013	130.4325	134.5785	140.0810	146.1770	151.4322	(44)
Energy conte	240.4552	211.5813	222.2993	189.7803	180.0622	158.0246	152.9923	161.5027	165.9488	190.0886	208.2559	237.1063	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	36.0683	31.7372	33.3449	28.4670	27.0093	23.7037	22.9488	24.2254	24.8923	28.5133	31.2384	35.5659	(46)
Water storage loss (or HIU loss):													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8802	(55)
Total storage loss													
	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862	(56)

If cylinder contains dedicated solar storage

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Primary loss	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862 (57)
Combi 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)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549	(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	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549 (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 =												2913.2663 (64)
Heat gains from water heating, kWh/month	120.3902	106.8762	114.3534	102.2363	100.3095	91.6776	91.3088	94.1385	94.3124	103.6433	108.3795	119.2767 (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	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.6931	37.0315	30.1160	22.7998	17.0431	14.3885	15.5473	20.2089	27.1244	34.4407	40.1973	42.8519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	544.7597	550.4126	536.1675	505.8413	467.5599	431.5808	407.5446	401.8917	416.1368	446.4630	484.7444	520.7235	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	(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)	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	(71)
Water heating gains (Table 5)	161.8148	159.0420	153.7008	141.9949	134.8247	127.3300	122.7269	126.5303	130.9894	139.3056	150.5271	160.3182	(72)
Total internal gains	864.0970	862.3154	835.8137	786.4653	735.2570	689.1286	661.6481	664.4602	690.0799	736.0385	791.2981	839.7229	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W				
North					27.2400	10.6334	0.4500	0.7000			0.7700	63.2299 (74)				
East					39.8600	19.6403	0.4500	0.7000			0.7700	170.8946 (76)				
South					7.6300	46.7521	0.4500	0.7000			0.7700	77.8698 (78)				
West					25.6100	19.6403	0.4500	0.7000			0.7700	109.7996 (80)				
North					0.8500	26.0000	0.7200	0.7000			1.0000	10.0246 (82)				
East					0.8500	26.0000	0.7200	0.7000			1.0000	10.0246 (82)				
South					0.8500	26.0000	0.7200	0.7000			1.0000	10.0246 (82)				
West					0.8500	26.0000	0.7200	0.7000			1.0000	10.0246 (82)				
Solar gains					461.8922	880.7447	1420.1210	2063.5990	2548.0199	2622.7629	2490.6548	2122.2286	1645.6508	1034.7310	571.1911	383.2146 (83)
Total gains					1325.9892	1743.0601	2255.9347	2850.0643	3283.2769	3311.8915	3152.3029	2786.6889	2335.7308	1770.7696	1362.4892	1222.9375 (84)

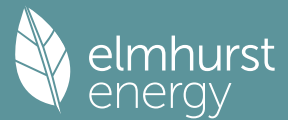
7. Mean internal temperature (heating season)

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	56.9745	57.1002	57.2265	57.8663	57.9960	58.6532	58.6532	58.7865	58.3885	57.9960	57.7372	57.4807	
alpha	4.7983	4.8067	4.8151	4.8578	4.8664	4.9102	4.9102	4.9191	4.8926	4.8664	4.8491	4.8320	
util living area	0.9965	0.9873	0.9500	0.8262	0.6280	0.4410	0.3211	0.3779	0.6466	0.9307	0.9914	0.9976	(86)
Living	19.8578	20.0819	20.4116	20.7423	20.8924	20.9305	20.9358	20.9347	20.9005	20.6181	20.1570	19.8194	
Non living	18.8629	19.0864	19.4069	19.7120	19.8280	19.8617	19.8639	19.8659	19.8430	19.6173	19.1714	18.8318	
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	20.4157	20.0819	20.4116	20.7423	20.8924	20.9305	20.9358	20.9347	20.9005	20.6181	20.1570	19.8466	(87)
Th 2	19.8992	19.9014	19.9035	19.9143	19.9164	19.9272	19.9272	19.9294	19.9229	19.9164	19.9121	19.9078	(88)
util rest of house	0.9953	0.9831	0.9349	0.7847	0.5653	0.3692	0.2433	0.2910	0.5603	0.9022	0.9880	0.9968	(89)
MIT 2	19.3691	19.0864	19.4069	19.7120	19.8280	19.8617	19.8639	19.8659	19.8430	19.6173	19.1714	18.9823	(90)
Living area fraction									fLA = Living area / (4) =			0.3437	(91)
MIT	19.7288	19.4286	19.7522	20.0662	20.1939	20.2291	20.2324	20.2333	20.2065	19.9613	19.5102	19.3268	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7288	19.4286	19.7522	20.0662	20.1939	20.2291	20.2324	20.2333	20.2065	19.9613	19.5102	19.3268	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	1319.5206	1709.7438	2103.4320	2254.2737	1910.3974	1290.3830	836.8983	880.0461	1364.2137	1600.1296	1343.9348	1218.3341	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	3663.5506	3442.1885	3132.8637	2610.5243	1981.3275	1298.3650	837.8176	882.1519	1414.8653	2183.6736	2907.8492	3560.2067	(97)
Space heating kWh	1743.9583	1164.2028	765.8972	256.5005	52.7720	0.0000	0.0000	0.0000	0.0000	434.1568	1126.0184	1742.3532	(98a)
Space heating requirement - total per year (kWh/year)												7285.8592	
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	1743.9583	1164.2028	765.8972	256.5005	52.7720	0.0000	0.0000	0.0000	0.0000	434.1568	1126.0184	1742.3532	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7285.8592	

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Space heating per m2

(98c) / (4) = 37.6200 (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													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	2168.1287	1706.8247	1748.9820	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9687	0.9851	0.9731	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2100.3555	1681.4259	1701.9890	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh						3702.6200	3523.5916	3104.1078	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	1153.6305	1370.5713	1043.1764	0.0000	0.0000	0.0000	0.0000	(104)
Intermittency factor (Table 10b)									fc = cooled area / (4) =			0.3150	(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	90.8394	107.9218	82.1420	0.0000	0.0000	0.0000	0.0000	(107)
												280.9032	(107)

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 %)													291.8634	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)													3.8100	(209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1743.9583	1164.2028	765.8972	256.5005	52.7720	0.0000	0.0000	0.0000	0.0000	434.1568	1126.0184	1742.3532	(98)	
Space heating efficiency (main heating system 1)	291.8634	291.8634	291.8634	291.8634	291.8634	0.0000	0.0000	0.0000	0.0000	291.8634	291.8634	291.8634	(210)	
Space heating fuel (main heating system)	597.5255	398.8862	262.4163	87.8837	18.0811	0.0000	0.0000	0.0000	0.0000	148.7534	385.8032	596.9755	(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	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549	(64)	
Efficiency of water heater	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	302.2397	(216)	
Fuel for water heating, kWh/month	96.2824	85.1106	90.2753	78.9765	76.3006	68.4697	67.3442	70.1600	71.0915	79.6180	85.0894	95.1744	(219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	23.8424	28.3259	21.5596	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	131.4816	118.7576	131.4816	127.2402	131.4816	127.2402	131.4816	131.4816	127.2402	131.4816	127.2402	131.4816	(231)	
Lighting	36.4938	29.2766	26.3604	19.3127	14.9177	12.1879	13.6084	17.6888	22.9760	30.1457	34.0495	37.5080	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-41.1877	-62.7774	-95.9894	-112.2634	-125.1253	-118.7342	-117.5194	-107.5069	-90.6453	-72.9345	-46.6036	-35.0121	(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)	-8.8988	-20.8025	-46.3569	-78.5087	-110.5575	-112.9796	-111.1321	-92.2671	-65.8178	-33.9113	-12.8062	-6.9017	(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													2496.3248	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													302.2397	
Water heating fuel used													963.8925	(219)
Space cooling fuel													73.7279	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 2.4000)														
mechanical ventilation fans (SFP = 2.4000)													1548.0895	(230a)
Total electricity for the above, kWh/year													1548.0895	(231)
Electricity for lighting (calculated in Appendix L)													294.5255	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation													-1727.2394	(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													3649.3208	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2496.3248	16.4900	411.6440	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	963.8925	16.4900	158.9459	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

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Space cooling	73.7279	16.4900	12.1577 (248)
Pumps, fans and electric keep-hot	1548.0895	16.4900	255.2800 (249)
Energy for lighting	294.5255	16.4900	48.5673 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1026.2991	16.4900	-169.2367
PV Unit electricity exported	-700.9403	5.5900	-39.1826
Total			-208.4193 (252)
Total energy cost			678.1755 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0229 (257)
SAP value		83.4183
SAP rating (Section 12)		83 (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	2496.3248	0.1571	392.1159 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	963.8925	0.1410	135.9018 (264)
Space and water heating			528.0177 (265)
Space cooling	73.7279	0.1142	8.4199 (266)
Pumps, fans and electric keep-hot	1548.0895	0.1387	214.7391 (267)
Energy for lighting	294.5255	0.1443	42.5091 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1026.2991	0.1336	-137.0700
PV Unit electricity exported	-700.9403	0.1231	-86.3073
Total			-223.3773 (269)
Total CO2, kg/year			570.3086 (272)
CO2 emissions per m2			2.9400 (273)
EI value			96.7980
EI rating			97 (274)
EI band			A

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

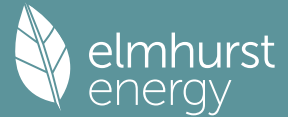
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	193.6700 (1b)	x 2.7300 (2b)	= 528.7191 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.6700		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 528.7191 (5)
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.8200 (17)
Infiltration rate	0.1410 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1198 (21)
Wind speed	Jan 5.0000 Feb 4.6000 Mar 4.4000 Apr 4.2000 May 4.4000 Jun 3.9000 Jul 4.1000 Aug 3.9000 Sep 4.0000 Oct 4.3000 Nov 4.3000 Dec 4.5000 (22)
Wind factor	1.2500 1.1500 1.1000 1.0500 1.1000 0.9750 1.0250 0.9750 1.0000 1.0750 1.0750 1.1250 (22a)
Adj infilt rate	0.1498 0.1378 0.1318 0.1258 0.1318 0.1169 0.1228 0.1169 0.1198 0.1288 0.1288 0.1348 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.6000 (23c)
Effective ac	0.2718 0.2598 0.2538 0.2478 0.2538 0.2389 0.2448 0.2389 0.2418 0.2508 0.2508 0.2568 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
Front Door			1.9500	1.0000	1.9500			(26)					
Windows			100.3400	0.8687	87.1680			(27)					
Velux			3.4000	1.2357	4.2015			(27a)					
Door to garage			1.6600	1.4000	2.3240			(26)					
Heatloss Floor 1			193.6700	0.1100	21.3037	75.0000	14525.2500	(28a)					
External Wall 1	227.5900	102.2900	125.3000	0.1200	15.0360	60.0000	7518.0000	(29a)					
sheltered to garage	18.4200	1.6600	16.7600	0.9000	15.0840	115.0000	1927.4000	(29a)					
flat ceiling	115.3500		115.3500	0.1000	11.5350	9.0000	1038.1500	(30)					
Roof sloping main	88.4000	3.4000	85.0000	0.1300	11.0500	9.0000	765.0000	(30)					
roof slope bed 2 above ceiling	19.7200		19.7200	0.1200	2.3664	9.0000	177.4800	(30)					
Total net area of external elements Aum(A, m2)			663.1500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	172.0186			(33)					
Main dwelling													
Internal Wall 1			303.3500			75.0000	22751.2500	(32c)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		48702.5300	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							251.4717	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E5 Ground floor (normal)				84.4200	0.0730		6.1627						
E5 Ground floor (normal)				7.2900	0.3200		2.3328						
E16 Corner (normal)				15.0000	0.0360		0.5400						
E17 Corner (inverted - internal area greater than external area)				20.0000	-0.0640		-1.2800						
E10 Eaves (insulation at ceiling level)				41.4000	0.0670		2.7738						
E12 Gable (insulation at ceiling level)				10.9400	0.0530		0.5798						
E11 Eaves (insulation at rafter level)				20.8600	0.0240		0.5006						
E13 Gable (insulation at rafter level)				16.3900	0.0490		0.8031						
R11 Upstands or kerbs of rooflights				21.1200	0.2400		5.0688						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.4816	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	189.5002	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 47.4251	Feb 45.3340	Mar 44.2884	Apr 43.2429	May 44.2884	Jun 41.6746	Jul 42.7201	Aug 41.6746	Sep 42.1973	Oct 43.7657	Nov 43.7657	Dec 44.8112	(38)
Heat transfer coeff	236.9253	234.8342	233.7887	232.7431	233.7887	231.1748	232.2203	231.1748	231.6975	233.2659	233.2659	234.3114	(39)
Average = Sum(39)m / 12 =												233.2659	
HLP	Jan 1.2233	Feb 1.2125	Mar 1.2071	Apr 1.2018	May 1.2071	Jun 1.1937	Jul 1.1991	Aug 1.1937	Sep 1.1964	Oct 1.2045	Nov 1.2045	Dec 1.2098	(40)
HLP (average)												1.2045	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

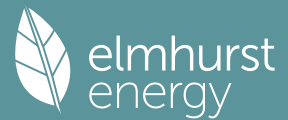
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9937 (42)
Hot water usage for mixer showers													
74.4140	73.2957	71.6661	68.5482	66.2473	63.6813	62.2228	63.8400	65.6129	68.3679	71.5528	74.1289	74.1289	(42a)
Hot water usage for baths													
32.1237	31.6466	30.9748	29.7360	28.8085	27.7800	27.2244	27.8916	28.6179	29.7185	30.9827	32.0151	32.0151	(42b)
Hot water usage for other uses													
45.2883	43.6414	41.9946	40.3477	38.7009	37.0540	37.0540	38.7009	40.3477	41.9946	43.6414	45.2883	45.2883	(42c)
Average daily hot water use (litres/day)													139.5621 (43)
Daily hot water use													
151.8260	148.5837	144.6355	138.6320	133.7567	128.5153	126.5013	130.4325	134.5785	140.0810	146.1770	151.4322	151.4322	(44)
Energy conte	240.4552	211.5813	222.2993	189.7803	180.0622	158.0246	152.9923	161.5027	165.9488	190.0886	208.2559	237.1063	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
36.0683	31.7372	33.3449	28.4670	27.0093	23.7037	22.9488	24.2254	24.8923	28.5133	31.2384	35.5659	35.5659	(46)
Water storage loss (or HIU loss):													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6300 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8802 (55)
Total storage loss													
27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	(56)
If cylinder contains dedicated solar storage													
27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	(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													
291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549	287.6549	(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													
291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549	287.6549	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
120.3902	106.8762	114.3534	102.2363	100.3095	91.6776	91.3088	94.1385	94.3124	103.6433	108.3795	119.2767	119.2767	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	179.6207	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
41.6931	37.0315	30.1160	22.7998	17.0431	14.3885	15.5473	20.2089	27.1244	34.4407	40.1973	42.8519	42.8519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

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Cooking gains	544.7597	550.4126	536.1675	505.8413	467.5599	431.5808	407.5446	401.8917	416.1368	446.4630	484.7444	520.7235 (68)
Pumps, fans	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558	55.9558 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472	-119.7472 (71)
Total internal gains	161.8148	159.0420	153.7008	141.9949	134.8247	127.3300	122.7269	126.5303	130.9894	139.3056	150.5271	160.3182 (72)
	864.0970	862.3154	835.8137	786.4653	735.2570	689.1286	661.6481	664.4602	690.0799	736.0385	791.2981	839.7229 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				27.2400	14.6401	0.4500	0.7000		0.7700		87.0551 (74)	
East				39.8600	27.3735	0.4500	0.7000		0.7700		238.1831 (76)	
South				7.6300	61.3950	0.4500	0.7000		0.7700		102.2589 (78)	
West				25.6100	27.3735	0.4500	0.7000		0.7700		153.0323 (80)	
North				0.8500	37.0000	0.7200	0.7000		1.0000		14.2657 (82)	
East				0.8500	37.0000	0.7200	0.7000		1.0000		14.2657 (82)	
South				0.8500	37.0000	0.7200	0.7000		1.0000		14.2657 (82)	
West				0.8500	37.0000	0.7200	0.7000		1.0000		14.2657 (82)	
Solar gains	637.5923	1016.6053	1638.9837	2459.0891	2936.3298	3232.7445	3049.7464	2608.7283	2026.4856	1270.3511	756.3396	512.8301 (83)
Total gains	1501.6893	1878.9207	2474.7974	3245.5544	3671.5868	3921.8731	3711.3946	3273.1886	2716.5656	2006.3896	1547.6377	1352.5530 (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	57.1002	57.6086	57.8663	58.1262	57.8663	58.5206	58.2571	58.5206	58.3885	57.9960	57.9960	57.7372	
alpha	4.8067	4.8406	4.8578	4.8751	4.8578	4.9014	4.8838	4.9014	4.8926	4.8664	4.8664	4.8491	
util living area	0.9919	0.9783	0.9128	0.7237	0.5055	0.3117	0.2126	0.2259	0.4708	0.8389	0.9765	0.9945 (86)	
Living	20.0455	20.2287	20.5693	20.8404	20.9209	20.9357	20.9365	20.9367	20.9291	20.7851	20.3808	20.0205	
Non living	19.0513	19.2377	19.5624	19.7925	19.8431	19.8616	19.8573	19.8619	19.8571	19.7580	19.3944	19.0358	
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	20.5117	20.2287	20.5693	20.8404	20.9209	20.9357	20.9365	20.9367	20.9291	20.7851	20.3808	20.1576 (87)	
Th 2	19.9014	19.9100	19.9143	19.9186	19.9143	19.9251	19.9208	19.9251	19.9229	19.9164	19.9164	19.9121 (88)	
util rest of house	0.9891	0.9712	0.8881	0.6713	0.4417	0.2488	0.1452	0.1501	0.3835	0.7816	0.9667	0.9924 (89)	
MIT 2	19.4665	19.2377	19.5624	19.7925	19.8431	19.8616	19.8573	19.8619	19.8571	19.7580	19.3944	19.1583 (90)	
Living area fraction	19.8258	19.5783	19.9085	20.1527	20.2136	20.2308	20.2283	20.2313	20.2256	fLA = Living area / (4) =			0.3437 (91)
MIT	19.8258	19.5783	19.9085	20.1527	20.2136	20.2308	20.2283	20.2313	20.2256	20.1110	19.7335	19.5018 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8258	19.5783	19.9085	20.1527	20.2136	20.2308	20.2283	20.2313	20.2256	20.1110	19.7335	19.5018 (93)	

8. Space heating requirement

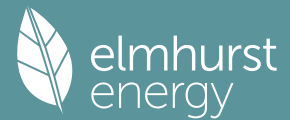
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9888	0.9685	0.8879	0.6832	0.4595	0.2668	0.1644	0.1717	0.4084	0.7931	0.9647	0.9915 (94)
Useful gains	1484.9235	1819.7143	2197.4008	2217.4859	1687.2630	1046.2104	610.2606	561.9759	1109.4868	1591.2246	1492.9507	1340.9974 (95)
Ext temp.	5.5000	5.8000	7.5000	9.9000	12.9000	15.7000	17.6000	17.8000	15.4000	12.2000	8.7000	5.7000 (96)
Heat loss rate W												
Space heating kWh	3394.1348	3235.6274	2900.9690	2386.2433	1709.8270	1047.3989	610.3363	562.0586	1118.0803	1845.3749	2573.7341	3233.9189 (97)
Space heating requirement - total per year (kWh/year)	1420.4532	951.4936	523.4548	121.5053	16.7876	0.0000	0.0000	0.0000	0.0000	189.0878	778.1640	1408.3336 (98a)
Solar heating kWh												5409.2799
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	1420.4532	951.4936	523.4548	121.5053	16.7876	0.0000	0.0000	0.0000	0.0000	189.0878	778.1640	1408.3336 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5409.2799
Space heating per m2											(98c) / (4) =	27.9304 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan 5.5000	Feb 5.8000	Mar 7.5000	Apr 9.9000	May 12.9000	Jun 15.7000	Jul 17.6000	Aug 17.8000	Sep 15.4000	Oct 12.2000	Nov 8.7000	Dec 5.7000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1918.7505	1486.2100	1433.2835	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9903	0.9958	0.9939	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1900.1469	1479.9660	1424.4689	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	4403.0874	4165.6187	3662.8495	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	1802.1171	1998.1256	1665.3551	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	fc = cooled area / (4) =											0.3150 (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	141.9026	157.3368	131.1337	0.0000	0.0000	0.0000	0.0000 (107)
												430.3731 (107)

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

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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 %)												291.8269	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)												3.8100	(209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1420.4532	951.4936	523.4548	121.5053	16.7876	0.0000	0.0000	0.0000	0.0000	189.0878	778.1640	1408.3336	(98)
Space heating efficiency (main heating system 1)	291.8269	291.8269	291.8269	291.8269	291.8269	0.0000	0.0000	0.0000	0.0000	291.8269	291.8269	291.8269	(210)
Space heating fuel (main heating system)	486.7452	326.0473	179.3717	41.6361	5.7526	0.0000	0.0000	0.0000	0.0000	64.7945	266.6526	482.5921	(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	291.0038	257.2381	272.8479	238.6983	230.6108	206.9426	203.5409	212.0513	214.8668	240.6372	257.1739	287.6549	(64)
Efficiency of water heater	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	302.2382	(216)
Fuel for water heating, kWh/month	96.2829	85.1110	90.2758	78.9769	76.3010	68.4700	67.3445	70.1603	71.0919	79.6184	85.0898	95.1749	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	37.2448	41.2957	34.4183	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	131.4816	118.7576	131.4816	127.2402	131.4816	127.2402	131.4816	131.4816	127.2402	131.4816	127.2402	131.4816	(231)
Lighting	36.4938	29.2766	26.3604	19.3127	14.9177	12.1879	13.6084	17.6888	22.9760	30.1457	34.0495	37.5080	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-53.8084	-69.3993	-104.3635	-123.7926	-135.7649	-135.1001	-133.1740	-122.5885	-104.1777	-82.8229	-57.8047	-44.6486	(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)	-14.6105	-25.9835	-58.0301	-101.2153	-133.5576	-148.4056	-144.6166	-120.6485	-86.3419	-46.8401	-20.0190	-10.8766	(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												1853.5920	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												302.2382	
Water heating fuel used												963.8974	(219)
Space cooling fuel												112.9588	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 2.4000)													
Mechanical ventilation fans (SFP = 2.4000)												1548.0895	(230a)
Total electricity for the above, kWh/year												1548.0895	(231)
Electricity for lighting (calculated in Appendix L)												294.5255	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2078.5905	(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												2694.4728	(238)

10a. Fuel costs - using BEDF prices (589)													
						Fuel		Fuel price		Fuel cost			
						kWh/year		p/kWh		£/year			
Space heating - main system 1						1853.5920		28.4300		526.9762		(240)	
Total CO2 associated with community systems										0.0000		(473)	
Water heating (other fuel)						963.8974		28.4300		274.0360		(247)	
Energy for instantaneous electric shower(s)						0.0000		28.4300		0.0000		(247a)	
Space cooling						112.9588		28.4300		32.1142		(248)	
Pumps, fans and electric keep-hot						1548.0895		28.4300		440.1219		(249)	
Energy for lighting						294.5255		28.4300		83.7336		(250)	
Additional standing charges										0.0000		(251)	
Energy saving/generation technologies													
PV Unit electricity used in dwelling						-1167.4451		28.4300		-331.9047			
PV Unit electricity exported						-911.1454		5.8100		-52.9375			
Total										-384.8422		(252)	
Total energy cost										972.1397		(255)	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP													
						Energy		Emission factor		Emissions			
						kWh/year		kg CO2/kWh		kg CO2/year			
Space heating - main system 1						1853.5920		0.1583		293.4033		(261)	
Total CO2 associated with community systems										0.0000		(373)	
Water heating (other fuel)						963.8974		0.1410		135.9025		(264)	
Space and water heating										429.3058		(265)	
Space cooling						112.9588		0.1143		12.9081		(266)	
Pumps, fans and electric keep-hot						1548.0895		0.1387		214.7391		(267)	
Energy for lighting						294.5255		0.1443		42.5091		(268)	
Energy saving/generation technologies													
PV Unit electricity used in dwelling						-1167.4451		0.1338		-156.1696			

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PV Unit electricity exported	-911.1454	0.1234	-112.4141
Total			-268.5838 (269)
Total CO2, kg/year			430.8783 (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	1853.5920	1.5859	2939.6446 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	963.8974	1.5213	1466.4199 (278)
Space and water heating			4406.0646 (279)
Space cooling	112.9588	1.4211	160.5298 (280)
Pumps, fans and electric keep-hot	1548.0895	1.5128	2341.9498 (281)
Energy for lighting	294.5255	1.5338	451.7531 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1167.4451	1.4943	-1744.5485
PV Unit electricity exported	-911.1454	0.4527	-412.4859
Total			-2157.0343 (283)
Total Primary energy kWh/year			5203.2629 (286)