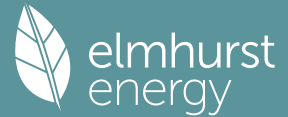


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Property Reference	104 Berkeley Avenue				Issued on Date	09/05/2025
Assessment Reference	Baseline		Prop Type Ref			
Property	104, Berkeley Avenue, Reading, RG1 6HY					
SAP Rating	81 B	DER	4.15	TER	10.93	
Environmental	96 A	% DER < TER				62.03
CO ₂ Emissions (t/year)	0.45	DFEE	43.88	TFEE	44.00	
Compliance Check	See BREL	% DFEE < TFEE				0.28
% DPER < TPER	24.25	DPER	43.45	TPER	57.36	
Assessor Details	Mr. Jonathon Hill				Assessor ID	K519-0001
Client	JCPI Lettings, 21454					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	66.6500 (1b)	x 2.6600 (2b)	= 177.2890 (1b) - (3b)
First floor	52.0000 (1c)	x 2.7500 (2c)	= 143.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 320.2890 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.0937 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3437 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3437 (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	0.4382	0.4296	0.4210	0.3780	0.3694	0.3265	0.3265	0.3179	0.3437	0.3694	0.3866	0.4038 (22b)
Effective ac	0.5960	0.5923	0.5886	0.5715	0.5682	0.5533	0.5533	0.5505	0.5591	0.5682	0.5747	0.5815 (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							
Windows			14.6000	1.3258	19.3561		(27)
Doors			1.7000	1.4000	2.3800		(26a)
Rooflights			0.8000	1.3258	1.0606		(27a)
Ground Floor			65.8000	0.1100	7.2380	110.0000	7238.0000 (28a)
Cavity Walls	121.4700	13.7000	107.7700	0.1900	20.4763	60.0000	6466.2000 (29a)
Dormer Walls	17.4100	2.6000	14.8100	0.1700	2.5177	18.0000	266.5800 (29a)
Sloped Roof	103.2000	0.8000	102.4000	0.1043	10.6768	9.0000	921.6000 (30)
Total net area of external elements Aum(A, m ²)			307.8800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.7054		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14892.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 125.5152 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.8000	0.0990	3.4452
E6 Intermediate floor within a dwelling	36.2000	0.0020	0.0724
E16 Corner (normal)	24.0500	0.0510	1.2266
E2 Other lintels (including other steel lintels)	6.9500	0.0150	0.1042
E2 Other lintels (including other steel lintels)	2.2000	1.0000	2.2000

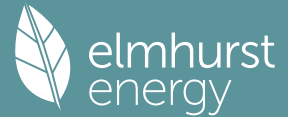
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 62.9942	Feb 62.6002	Mar 62.2140	Apr 60.4001	May 60.0607	Jun 58.4808	Jul 58.4808	Aug 58.1882	Sep 59.0893	Oct 60.0607	Nov 60.7472	Dec 61.4650 (38)
Heat transfer coeff	138.2563	137.8623	137.4761	135.6621	135.3228	133.7428	133.7428	133.4503	134.3514	135.3228	136.0093	136.7271 (39)
Average = Sum(39)m / 12 =												135.6605
HLP	Jan 1.1652	Feb 1.1619	Mar 1.1587	Apr 1.1434	May 1.1405	Jun 1.1272	Jul 1.1272	Aug 1.1247	Sep 1.1323	Oct 1.1405	Nov 1.1463	Dec 1.1524 (40)
HLP (average)	1.1434											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

												2.8579	(42)
Assumed occupancy													
Hot water usage for mixer showers													
	72.1381	71.0541	69.4743	66.4518	64.2212	61.7337	60.3198	61.8876	63.6062	66.2770	69.3645	71.8618	(42a)
Hot water usage for baths													
	31.1450	30.6824	30.0311	28.8301	27.9308	26.9336	26.3950	27.0418	27.7461	28.8131	30.0388	31.0397	(42b)
Hot water usage for other uses													
	43.8982	42.3019	40.7056	39.1093	37.5130	35.9167	35.9167	37.5130	39.1093	40.7056	42.3019	43.8982	(42c)
Average daily hot water use (litres/day)													
												135.2927	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	147.1813	144.0384	140.2110	134.3912	129.6650	124.5840	122.6315	126.4424	130.4615	135.7957	141.7052	146.7997	(44)
Energy conte													
	233.0993	205.1088	215.4991	183.9748	174.5540	153.1906	148.3122	156.5621	160.8721	184.2734	201.8850	229.8528	(45)
Energy content (annual)													
Distribution loss	(46)m = 0.15 x	(45)m								Total = Sum(45)m =		2247.1840	
	34.9649	30.7663	32.3249	27.5962	26.1831	22.9786	22.2468	23.4843	24.1308	27.6410	30.2827	34.4779	(46)
Water storage loss:													
Store volume													
a) If manufacturer declared loss factor is known	(kWh/day):											1.2200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6588	(55)
Total storage loss													
	20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	(56)
If cylinder contains dedicated solar storage													
	20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	(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													
	276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	273.5380	(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													
	276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	273.5380	(64)
Total per year (kWh/year)													
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
	112.4537	99.7647	106.6016	94.9924	92.9874	84.7567	84.2620	87.0051	87.3108	96.2191	100.9476	111.3742	(65)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	155.5851	172.2549	155.5851	160.7713	155.5851	160.7713	155.5851	155.5851	160.7713	155.5851	160.7713	155.5851	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.4451	286.3864	278.9745	263.1954	243.2771	224.5568	212.0504	209.1092	216.5211	232.3002	252.2184	270.9388	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	(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)	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	(71)
Water heating gains (Table 5)	151.1474	148.4594	143.2817	131.9339	124.9830	117.7176	113.2553	116.9423	121.2650	129.3267	140.2049	149.6965	(72)
Total internal gains	656.0468	672.9699	643.7105	621.7698	589.7144	568.9148	546.7600	547.5057	564.4265	583.0811	619.0638	642.0896	(73)

[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	5.2000	10.6334	0.7200	0.7000	0.7700	19.3125 (74)
South	1.3000	46.7521	0.7200	0.7000	0.7700	21.2279 (78)
West	8.1000	19.6403	0.7200	0.7000	0.7700	55.5643 (80)
South	0.8000	43.9921	0.6300	0.7000	1.0000	13.9684 (82)

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Solar gains	110.0732	205.8563	324.5268	464.3063	569.8547	585.7715	556.5449	475.9710	373.2936	239.6431	135.3291	91.8659 (83)
Total gains	766.1200	878.8263	968.2373	1086.0761	1159.5691	1154.6863	1103.3049	1023.4767	937.7201	822.7242	754.3929	733.9555 (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	29.9210	30.0065	30.0908	30.4932	30.5697	30.9308	30.9308	30.9986	30.7907	30.5697	30.4154	30.2557	
alpha	2.9947	3.0004	3.0061	3.0329	3.0380	3.0621	3.0621	3.0666	3.0527	3.0380	3.0277	3.0170	
util living area	0.9751	0.9616	0.9379	0.8808	0.7822	0.6323	0.4940	0.5426	0.7489	0.9082	0.9618	0.9780 (86)	
Living	18.6835	18.9593	19.3871	19.9774	20.4749	20.8112	20.9348	20.9121	20.6633	20.0135	19.2623	18.6487	
Non living	17.2458	17.5962	18.1368	18.8746	19.4651	19.8351	19.9444	19.9310	19.6922	18.9343	17.9919	17.2077	
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	19.8150	18.9593	19.3871	19.9774	20.4749	20.8112	20.9348	20.9121	20.6633	20.0135	19.2623	18.9776 (87)	
Th 2	19.9479	19.9506	19.9532	19.9656	19.9679	19.9787	19.9787	19.9807	19.9745	19.9679	19.9632	19.9583 (88)	
util rest of house	0.9707	0.9548	0.9264	0.8579	0.7387	0.5584	0.3934	0.4417	0.6850	0.8857	0.9539	0.9741 (89)	
MIT 2	18.8707	17.5962	18.1368	18.8746	19.4651	19.8351	19.9444	19.9310	19.6922	18.9343	17.9919	17.7034 (90)	
Living area fraction									FLA = Living area / (4) =				0.4303 (91)
MIT	19.2770	18.1827	18.6747	19.3491	19.8996	20.2551	20.3705	20.3531	20.1100	19.3987	18.5385	18.2516 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2770	18.1827	18.6747	19.3491	19.8996	20.2551	20.3705	20.3531	20.1100	19.3987	18.5385	18.2516 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9673	0.9393	0.9085	0.8417	0.7355	0.5796	0.4335	0.4803	0.6944	0.8703	0.9391	0.9654 (94)
Useful gains	741.0738	825.4911	879.5956	914.1162	852.9064	669.2951	478.2967	491.6201	651.1394	716.0352	708.4780	708.5468 (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	2070.6603	1831.1772	1673.7343	1417.5480	1109.5878	756.3245	504.2798	527.5409	807.4568	1190.6598	1555.7433	1921.2339 (97)
Space heating kWh	989.2124	675.8211	590.8392	362.4709	190.9710	0.0000	0.0000	0.0000	0.0000	353.1207	610.0310	902.2393 (98a)
Space heating requirement - total per year (kWh/year)												4674.7055
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	989.2124	675.8211	590.8392	362.4709	190.9710	0.0000	0.0000	0.0000	0.0000	353.1207	610.0310	902.2393 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4674.7055
Space heating per m2											(98c) / (4) =	39.3991 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												305.9547 (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	989.2124	675.8211	590.8392	362.4709	190.9710	0.0000	0.0000	0.0000	0.0000	353.1207	610.0310	902.2393 (98)
Space heating efficiency (main heating system 1)	305.9547	305.9547	305.9547	305.9547	305.9547	0.0000	0.0000	0.0000	0.0000	305.9547	305.9547	305.9547 (210)
Space heating fuel (main heating system)	323.3199	220.8893	193.1133	118.4721	62.4181	0.0000	0.0000	0.0000	0.0000	115.4160	199.3861	294.8931 (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	276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	273.5380 (64)
Efficiency of water heater (217)m	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433 (216)
Fuel for water heating, kWh/month	148.7742	131.4567	139.3140	121.6119	117.3056	105.0651	103.2004	107.6348	109.1940	122.5299	131.2388	147.0292 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.8340	31.9563	28.7731	21.0804	16.2831	13.3034	14.8540	19.3078	25.0789	32.9049	37.1660	40.9411 (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												1527.9078 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	186.0433	
Water heating fuel used	1484.3546	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	321.4831	(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	3333.7455	(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	1527.9078	0.1549	236.6419	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1484.3546	0.1410	209.3599	(264)
Space and water heating			446.0018	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	321.4831	0.1443	46.3999	(268)
Total CO2, kg/year			492.4017	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1500	(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	1527.9078	1.5734	2403.9524	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1484.3546	1.5215	2258.5020	(278)
Space and water heating			4662.4545	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	321.4831	1.5338	493.1015	(282)
Total Primary energy kWh/year			5155.5560	(286)
Dwelling Primary energy Rate (DPER)			43.4500	(287)

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

1. Overall dwelling characteristics

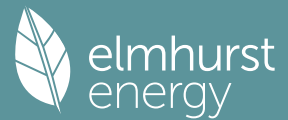
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	66.6500 (1b)	x 2.6600 (2b)	= 177.2890 (1b) - (3b)	
First floor	52.0000 (1c)	x 2.7500 (2c)	= 143.0000 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6500		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	320.2890 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1249 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3749	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3749 (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	0.4780	0.4686	0.4592	0.4124	0.4030	0.3561	0.3561	0.3468	0.3749	0.4030	0.4217	0.4405 (22b)
Effective ac	0.6142	0.6098	0.6054	0.5850	0.5812	0.5634	0.5634	0.5601	0.5703	0.5812	0.5889	0.5970 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			1.7000	1.0000	1.7000			(26a)
TER Opening Type			14.6000	1.1450	16.7176			(27)
TER Roof Light			0.8000	1.5918	1.5498			(27a)
Ground Floor			65.8000	0.1300	8.5540			(28a)
Cavity Walls	121.4700	13.7000	107.7700	0.1800	19.3986			(29a)
Dormer Walls	17.4100	2.6000	14.8100	0.1800	2.6658			(29a)
Sloped Roof	103.2000	0.8000	102.4000	0.1100	11.2640			(30)
Total net area of external elements Aum (A, m2)			307.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.8498			(33)

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

125.5152 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	34.8000	0.1600	5.5680	
E6 Intermediate floor within a dwelling	36.2000	0.0000	0.0000	
E16 Corner (normal)	24.0500	0.0900	2.1645	
E2 Other lintels (including other steel lintels)	6.9500	0.0500	0.3475	
E2 Other lintels (including other steel lintels)	2.2000	0.0500	0.1100	
E3 Sill	6.9500	0.0500	0.3475	
E3 Sill	2.2000	0.0500	0.1100	
E4 Jamb	13.9000	0.0500	0.6950	
E4 Jamb	4.4000	0.0500	0.2200	
E17 Corner (inverted - internal area greater than external area)	10.7000	-0.0900	-0.9630	
E11 Eaves (insulation at rafter level)	18.8000	0.0400	0.7520	
E13 Gable (insulation at rafter level)	23.2000	0.0800	1.8560	
R1 Head of roof window	1.2000	0.0800	0.0960	
R2 Sill of roof window	1.2000	0.0600	0.0720	
R3 Jamb of roof window	2.4000	0.0800	0.1920	
E16 Corner (normal)	8.6000	0.0900	0.7740	

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

Point Thermal bridges		(36a) =	12.3415 (36)
Total fabric heat loss	(33) + (36) + (36a) =		74.1913 (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	64.9216	64.4527	63.9932	61.8346	61.4308	59.5508	59.5508	59.2026	60.2749	61.4308	62.2478	63.1019	(38)
Heat transfer coeff	139.1129	138.6440	138.1845	136.0259	135.6221	133.7420	133.7420	133.3939	134.4662	135.6221	136.4391	137.2932	(39)
Average = Sum(39)m / 12 =												136.0240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1725	1.1685	1.1646	1.1464	1.1430	1.1272	1.1272	1.1243	1.1333	1.1430	1.1499	1.1571	(40)
HLP (average)												1.1464	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

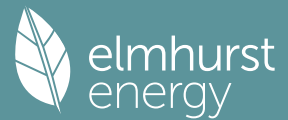
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8579 (42)
Hot water usage for mixer showers													
72.1381	71.0541	69.4743	66.4518	64.2212	61.7337	60.3198	61.8876	63.6062	66.2770	69.3645	71.8618		(42a)
Hot water usage for baths													
31.1450	30.6824	30.0311	28.8301	27.9308	26.9336	26.3950	27.0418	27.7461	28.8131	30.0388	31.0397		(42b)
Hot water usage for other uses													
43.8982	42.3019	40.7056	39.1093	37.5130	35.9167	35.9167	37.5130	39.1093	40.7056	42.3019	43.8982		(42c)
Average daily hot water use (litres/day)												135.2927	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.1813	144.0384	140.2110	134.3912	129.6650	124.5840	122.6315	126.4424	130.4615	135.7957	141.7052	146.7997	(44)
Energy conte	233.0993	205.1088	215.4991	183.9748	174.5540	153.1906	148.3122	156.5621	160.8721	184.2734	201.8850	229.8528	(45)
Energy content (annual)										Total = Sum(45)m =		2247.1840	
Distribution loss (46)m = 0.15 x (45)m													
34.9649	30.7663	32.3249	27.5962	26.1831	22.9786	22.2468	23.4843	24.1308	27.6410	30.2827	34.4779		(46)
Water storage loss:													
Store volume												191.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6077	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8682	(55)
Total storage loss													
26.9134	24.3089	26.9134	26.0453	26.9134	26.0453	26.9134	26.9134	26.9134	26.0453	26.9134	26.0453	26.9134	(56)
If cylinder contains dedicated solar storage													
26.9134	24.3089	26.9134	26.0453	26.9134	26.0453	26.9134	26.9134	26.9134	26.0453	26.9134	26.0453	26.9134	(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													
283.2751	250.4289	265.6749	232.5320	224.7298	201.7479	198.4880	206.7379	209.4294	234.4493	250.4422	280.0286		(62)
WWHRS	-32.9785	-29.1665	-30.5415	-25.2895	-23.5690	-20.1681	-18.9044	-20.1029	-20.8667	-24.5996	-27.8683	-32.3678	(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													
250.2966	221.2624	235.1334	207.2425	201.1609	181.5797	179.5836	186.6350	188.5627	209.8497	222.5739	247.6608		(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2531.5412	(64)
Electric shower(s)												2532	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
117.6462	104.4548	111.7941	100.0174	98.1799	89.7817	89.4545	92.1976	92.3358	101.4116	105.9726	116.5667		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
155.5851	172.2549	155.5851	160.7713	155.5851	160.7713	155.5851	155.5851	160.7713	155.5851	160.7713	155.5851		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

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Cooking gains	283.4451	286.3864	278.9745	263.1954	243.2771	224.5568	212.0504	209.1092	216.5211	232.3002	252.2184	270.9388 (68)
Pumps, fans	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897 (69)
Losses e.g. evaporation	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)	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178 (71)
Total internal gains	158.1266	155.4386	150.2609	138.9131	131.9622	124.6968	120.2345	123.9215	128.2441	136.3059	147.1841	156.6757 (72)
	666.0260	682.9491	653.6897	631.7489	599.6936	575.8940	553.7392	554.4849	571.4057	593.0603	629.0430	652.0688 (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					5.2000	10.6334	0.6300	0.7000			0.7700	16.8985 (74)	
South					1.3000	46.7521	0.6300	0.7000			0.7700	18.5745 (78)	
West					8.1000	19.6403	0.6300	0.7000			0.7700	48.6188 (80)	
South					0.8000	43.9921	0.6300	0.7000			1.0000	13.9684 (82)	

Solar gains	98.0601	183.3103	288.7760	412.8241	506.3786	520.3975	494.4835	423.0860	332.0616	213.3421	120.5455	81.8489 (83)	
Total gains	764.0860	866.2594	942.4657	1044.5731	1106.0722	1096.2915	1048.2227	977.5709	903.4672	806.4024	749.5885	733.9177 (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	29.7368	29.8374	29.9366	30.4116	30.5022	30.9310	30.9310	31.0117	30.7644	30.5022	30.3196	30.1309
alpha	2.9825	2.9892	2.9958	3.0274	3.0335	3.0621	3.0621	3.0674	3.0510	3.0335	3.0213	3.0087
util living area	0.9754	0.9630	0.9419	0.8902	0.7991	0.6542	0.5149	0.5618	0.7631	0.9122	0.9625	0.9780 (86)
MIT	18.6647	18.9286	19.3444	19.9319	20.4364	20.7919	20.9269	20.9032	20.6430	19.9924	19.2492	18.6379 (87)
Th 2	19.9421	19.9453	19.9484	19.9631	19.9658	19.9787	19.9787	19.9811	19.9737	19.9658	19.9603	19.9545 (88)
util rest of house	0.9709	0.9564	0.9309	0.8685	0.7571	0.5804	0.4118	0.4593	0.7004	0.8905	0.9547	0.9741 (89)
MIT 2	17.2185	17.5544	18.0810	18.8192	19.4224	19.8187	19.9398	19.9257	19.6721	18.9079	17.9736	17.1917 (90)
Living area fraction									FLA = Living area / (4) =			0.4303 (91)
MIT	17.8407	18.1457	18.6246	19.2979	19.8587	20.2374	20.3645	20.3463	20.0898	19.3745	18.5224	17.8139 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8407	18.1457	18.6246	19.2979	19.8587	20.2374	20.3645	20.3463	20.0898	19.3745	18.5224	17.8139 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9586	0.9412	0.9132	0.8518	0.7522	0.6004	0.4525	0.4980	0.7083	0.8750	0.9400	0.9626 (94)
Ext temp.	732.4206	815.2891	860.6888	889.8047	832.0102	658.2083	474.2843	486.8375	639.9657	705.5758	704.5981	706.5055 (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	1883.6870	1836.4327	1675.4344	1414.3904	1106.4998	753.9640	503.4708	526.4132	805.4260	1190.0211	1558.4680	1869.1008 (97)
Space heating requirement - total per year (kWh/year)	856.5422	686.2085	606.1707	377.7017	204.2203	0.0000	0.0000	0.0000	0.0000	360.4273	614.7864	864.9709 (98a)
Solar heating kWh												4571.0279
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	856.5422	686.2085	606.1707	377.7017	204.2203	0.0000	0.0000	0.0000	0.0000	360.4273	614.7864	864.9709 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4571.0279
Space heating per m ²										(98c) / (4) =		38.5253 (99)

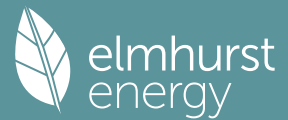
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	856.5422	686.2085	606.1707	377.7017	204.2203	0.0000	0.0000	0.0000	0.0000	360.4273	614.7864	864.9709 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	927.9981	743.4545	656.7397	409.2109	221.2571	0.0000	0.0000	0.0000	0.0000	390.4955	666.0741	937.1299 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	250.2966	221.2624	235.1334	207.2425	201.1609	181.5797	179.5836	186.6350	188.5627	209.8497	222.5739	247.6608 (64)
Efficiency of water heater (217)m	86.5916	86.4235	86.0865	85.3881	84.0937	79.8000	79.8000	79.8000	79.8000	85.2615	86.2154	79.8000 (216)
Fuel for water heating, kWh/month	289.0542	256.0212	273.1364	242.7066	239.2105	227.5435	225.0421	233.8784	236.2941	246.1247	258.1602	285.8988 (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	32.3275	25.9343	23.3510	17.1079	13.2147	10.7965	12.0549	15.6694	20.3529	26.7042	30.1623	33.2260 (232)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	4952.3596	1.1300	5596.1664 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3013.0707	1.1300	3404.7699 (278)
Space and water heating			9000.9363 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	260.9015	1.5338	400.1795 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1158.2857	1.4996	-1736.9372
PV Unit electricity exported	-2136.0576	0.4630	-989.0972
Total			-2726.0345 (283)
Total Primary energy kWh/year			6805.1822 (286)
Target Primary Energy Rate (TPER)			57.3600 (287)

2. Ventilation rate	m3 per hour
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Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1249 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3749	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3749	(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)
	0.4780	0.4686	0.4592	0.4124	0.4030	0.3561	0.3561	0.3468	0.3749	0.4030	0.4217	0.4405	(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	0.6142	0.6098	0.6054	0.5850	0.5812	0.5634	0.5634	0.5601	0.5703	0.5812	0.5889	0.5970	(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								
Windows			14.6000	1.3258	19.3561			(27)
Doors			1.7000	1.4000	2.3800			(26a)
Rooflights			0.8000	1.3258	1.0606			(27a)
Ground Floor			65.8000	0.1100	7.2380	110.0000	7238.0000	(28a)
Cavity Walls	121.4700	13.7000	107.7700	0.1900	20.4763	60.0000	6466.2000	(29a)
Dormer Walls	17.4100	2.6000	14.8100	0.1700	2.5177	18.0000	266.5800	(29a)
Sloped Roof	103.2000	0.8000	102.4000	0.1043	10.6768	9.0000	921.6000	(30)
Total net area of external elements Aum(A, m2)			307.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.7054			(33)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14892.3800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		125.5152	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E5 Ground floor (normal)	34.8000	0.0990	3.4452	
E6 Intermediate floor within a dwelling	36.2000	0.0020	0.0724	
E16 Corner (normal)	24.0500	0.0510	1.2266	
E2 Other lintels (including other steel lintels)	6.9500	0.0150	0.1042	
E2 Other lintels (including other steel lintels)	2.2000	1.0000	2.2000	
E3 Sill	6.9500	0.0210	0.1460	
E3 Sill	2.2000	0.1000	0.2200	
E4 Jamb	13.9000	0.0160	0.2224	
E4 Jamb	4.4000	0.1000	0.4400	
E17 Corner (inverted - internal area greater than external area)	10.7000	-0.0910	-0.9737	
E11 Eaves (insulation at rafter level)	18.8000	0.0180	0.3384	
E13 Gable (insulation at rafter level)	23.2000	0.0610	1.4152	
R1 Head of roof window	1.2000	0.2400	0.2880	
R2 Sill of roof window	1.2000	0.2400	0.2880	
R3 Jamb of roof window	2.4000	0.2400	0.5760	
E16 Corner (normal)	8.6000	0.1800	1.5480	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.5567	(36)
Point Thermal bridges			0.0000	(36a)
Total fabric heat loss	(33) + (36) + (36a) =		75.2621	(37)

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

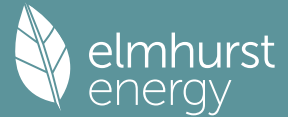
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	64.9216	64.4527	63.9932	61.8346	61.4308	59.5508	59.5508	59.2026	60.2749	61.4308	62.2478	63.1019	(38)
Average = Sum(39)m / 12 =	140.1837	139.7148	139.2553	137.0967	136.6929	134.8129	134.8129	134.4647	135.5370	136.6929	137.5099	138.3640	(39)
												137.0948	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1815	1.1775	1.1737	1.1555	1.1521	1.1362	1.1362	1.1333	1.1423	1.1521	1.1590	1.1662	(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													2.8579 (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													
	31.1450	30.6824	30.0311	28.8301	27.9308	26.9336	26.3950	27.0418	27.7461	28.8131	30.0388	31.0397	(42b)
Hot water usage for other uses													
	43.8982	42.3019	40.7056	39.1093	37.5130	35.9167	35.9167	37.5130	39.1093	40.7056	42.3019	43.8982	(42c)
Average daily hot water use (litres/day)													68.7838 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	75.0432	72.9843	70.7367	67.9394	65.4438	62.8503	62.3117	64.5548	66.8554	69.5187	72.3407	74.9379	(44)
Energy conte	118.8501	103.9287	108.7197	93.0056	88.0999	77.2818	75.3606	79.9323	82.4394	94.3362	103.0626	117.3346	(45)
Energy content (annual)										Total = Sum(45)m =		1142.3515	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

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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												
	101.0226	88.3394	92.4117	79.0548	74.8849	65.6895	64.0565	67.9425	70.0734	80.1858	87.6032	99.7344 (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	101.0226	88.3394	92.4117	79.0548	74.8849	65.6895	64.0565	67.9425	70.0734	80.1858	87.6032	99.7344 (64)
Total per year (kWh/year) = Sum(64)m =											970.9988 (64)	
												971 (64)
12Total per year (kWh/year)												
Electric shower(s)	57.7706	51.4741	56.2078	53.6384	54.6449	52.1259	53.8634	54.6449	53.6384	56.2078	55.1508	57.7706 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											657.1376 (64a)	
Heat gains from water heating, kWh/month												
	39.6983	34.9534	37.1549	33.1733	32.3825	29.4539	29.4800	30.6468	30.9280	34.0984	35.6885	39.3763 (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	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	155.5851	172.2549	155.5851	160.7713	155.5851	160.7713	155.5851	155.5851	160.7713	155.5851	160.7713	155.5851 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	283.4451	286.3864	278.9745	263.1954	243.2771	224.5568	212.0504	209.1092	216.5211	232.3002	252.2184	270.9388 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897 (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)												
	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178 (71)
Water heating gains (Table 5)												
	53.3579	52.0140	49.9393	46.0740	43.5248	40.9081	39.6236	41.1920	42.9555	45.8312	49.5674	52.9251 (72)
Total internal gains	558.2573	576.5245	550.3681	535.9099	508.2562	492.1054	473.1283	471.7554	486.1170	499.5856	528.4262	545.3181 (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					5.2000	10.6334	0.7200	0.7000			0.7700	19.3125 (74)	
South					1.3000	46.7521	0.7200	0.7000			0.7700	21.2279 (78)	
West					8.1000	19.6403	0.7200	0.7000			0.7700	55.5643 (80)	
South					0.8000	43.9921	0.6300	0.7000			1.0000	13.9684 (82)	

Solar gains	110.0732	205.8563	324.5268	464.3063	569.8547	585.7715	556.5449	475.9710	373.2936	239.6431	135.3291	91.8659 (83)	
Total gains	668.3305	782.3808	874.8949	1000.2162	1078.1109	1077.8769	1029.6732	947.7264	859.4106	739.2287	663.7554	637.1841 (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	29.5097	29.6087	29.7064	30.1741	30.2633	30.6853	30.6853	30.7647	30.5213	30.2633	30.0835	29.8977
alpha	2.9673	2.9739	2.9804	3.0116	3.0176	3.0457	3.0457	3.0510	3.0348	3.0176	3.0056	2.9932
util living area	0.9826	0.9714	0.9514	0.9004	0.8092	0.6639	0.5251	0.5777	0.7830	0.9281	0.9724	0.9848 (86)
MIT	18.5138	18.7990	19.2441	19.8720	20.4061	20.7797	20.9214	20.8936	20.6083	19.9047	19.1188	18.4837 (87)
Th 2	19.9348	19.9380	19.9411	19.9558	19.9585	19.9714	19.9714	19.9737	19.9664	19.9585	19.9530	19.9472 (88)
util rest of house	0.9793	0.9661	0.9420	0.8801	0.7681	0.5897	0.4202	0.4734	0.7222	0.9093	0.9664	0.9820 (89)
MIT 2	17.6658	17.9501	18.3912	19.0106	19.5106	19.8390	19.9387	19.9260	19.7059	19.0546	18.2798	17.6442 (90)
Living area fraction	18.0307	18.3153	18.7582	19.3812	19.8959	20.2437	20.3615	20.3423	20.0941	19.4204	18.6408	18.0054 (91)
MIT	18.0307	18.3153	18.7582	19.3812	19.8959	20.2437	20.3615	20.3423	20.0941	19.4204	18.6408	18.0054 (92)
Temperature adjustment	18.0307	18.3153	18.7582	19.3812	19.8959	20.2437	20.3615	20.3423	20.0941	19.4204	18.6408	18.0054 (93)

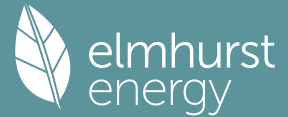
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9713	0.9553	0.9285	0.8668	0.7653	0.6108	0.4618	0.5131	0.7306	0.8972	0.9563	0.9748 (94)
Useful gains	649.1364	747.3785	812.3462	866.9734	825.1035	658.3361	475.5410	486.2510	627.9061	663.2277	634.7565	621.1037 (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	1924.8151	1874.3220	1707.0160	1436.9408	1120.3210	760.8499	507.1013	530.1037	812.4261	1205.6809	1586.9770	1910.1714 (97)
Space heating kWh	949.1049	757.3060	665.6343	410.3765	219.6418	0.0000	0.0000	0.0000	0.0000	403.5852	685.5988	959.0664 (98a)
Space heating requirement - total per year (kWh/year)												5050.3138
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	949.1049	757.3060	665.6343	410.3765	219.6418	0.0000	0.0000	0.0000	0.0000	403.5852	685.5988	959.0664 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5050.3138
Space heating per m2												42.5648 (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

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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	1267.2409	997.6152	1021.9318	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7240	0.7956	0.7568	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	917.4730	793.6532	773.4167	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1175.9140	1123.3587	1031.9795	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	186.0775	245.3009	192.3707	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	46.5194	61.3252	48.0927	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												155.9373 (107)
Energy for space heating												42.5648 (99)
Energy for space cooling												1.3143 (108)
Total												43.8791 (109)
Fabric Energy Efficiency (DFEE)												43.9 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.6500 (1b)	x 2.6600 (2b)	= 177.2890 (1b) - (3b)
First floor	52.0000 (1c)	x 2.7500 (2c)	= 143.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 320.2890 (5)

2. Ventilation rate

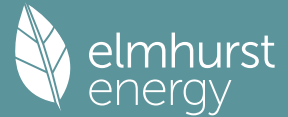
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1249 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3749 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3749 (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	0.4780	0.4686	0.4592	0.4124	0.4030	0.3561	0.3561	0.3468	0.3749	0.4030	0.4217	0.4405 (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	0.6142	0.6098	0.6054	0.5850	0.5812	0.5634	0.5634	0.5601	0.5703	0.5812	0.5889	0.5970 (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 Semi-glazed door			1.7000	1.0000	1.7000		(26a)
TER Opening Type			14.6000	1.1450	16.7176		(27)
TER Roof Light			0.8000	1.5918	1.5498		(27a)
Ground Floor			65.8000	0.1300	8.5540		(28a)
Cavity Walls	121.4700	13.7000	107.7700	0.1800	19.3986		(29a)
Dormer Walls	17.4100	2.6000	14.8100	0.1800	2.6658		(29a)
Sloped Roof	103.2000	0.8000	102.4000	0.1100	11.2640		(30)
Total net area of external elements Aum(A, m2)			307.8800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.8498		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							125.5152 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E5 Ground floor (normal)				34.8000	0.1600		5.5680
E6 Intermediate floor within a dwelling				36.2000	0.0000		0.0000
E16 Corner (normal)				24.0500	0.0900		2.1645
E2 Other lintels (including other steel lintels)				6.9500	0.0500		0.3475
E2 Other lintels (including other steel lintels)				2.2000	0.0500		0.1100
E3 Sill				6.9500	0.0500		0.3475
E3 Sill				2.2000	0.0500		0.1100
E4 Jamb				13.9000	0.0500		0.6950
E4 Jamb				4.4000	0.0500		0.2200

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E17 Corner (inverted - internal area greater than external area)	10.7000	-0.0900	-0.9630										
E11 Eaves (insulation at rafter level)	18.8000	0.0400	0.7520										
E13 Gable (insulation at rafter level)	23.2000	0.0800	1.8560										
R1 Head of roof window	1.2000	0.0800	0.0960										
R2 Sill of roof window	1.2000	0.0600	0.0720										
R3 Jamb of roof window	2.4000	0.0800	0.1920										
E16 Corner (normal)	8.6000	0.0900	0.7740										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				12.3415 (36)									
Point Thermal Bridges			(36a) =	0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		74.1913 (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	64.9216	64.4527	63.9932	61.8346	61.4308	59.5508	59.5508	59.2026	60.2749	61.4308	62.2478	63.1019	(38)
Average = Sum(39)m / 12 =	139.1129	138.6440	138.1845	136.0259	135.6221	133.7420	133.7420	133.3939	134.4662	135.6221	136.4391	137.2932	(39)
												136.0240	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1725	1.1685	1.1646	1.1464	1.1430	1.1272	1.1272	1.1243	1.1333	1.1430	1.1499	1.1571	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.1464	
												31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.8579 (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	31.1450	30.6824	30.0311	28.8301	27.9308	26.9336	26.3950	27.0418	27.7461	28.8131	30.0388	31.0397	(42b)
Hot water usage for other uses	43.8982	42.3019	40.7056	39.1093	37.5130	35.9167	35.9167	37.5130	39.1093	40.7056	42.3019	43.8982	(42c)
Average daily hot water use (litres/day)													68.7838 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	75.0432	72.9843	70.7367	67.9394	65.4438	62.8503	62.3117	64.5548	66.8554	69.5187	72.3407	74.9379	(44)
Energy content (annual)	118.8501	103.9287	108.7197	93.0056	88.0999	77.2818	75.3606	79.9323	82.4394	94.3362	103.0626	117.3346	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
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	101.0226	88.3394	92.4117	79.0548	74.8849	65.6895	64.0565	67.9425	70.0734	80.1858	87.6032	99.7344	(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	101.0226	88.3394	92.4117	79.0548	74.8849	65.6895	64.0565	67.9425	70.0734	80.1858	87.6032	99.7344	(64)
												970.9988	(64)
												971	(64)
12Total per year (kWh/year)													
Electric shower(s)	57.7706	51.4741	56.2078	53.6384	54.6449	52.1259	53.8634	54.6449	53.6384	56.2078	55.1508	57.7706	(64a)
												657.1376	(64a)
Heat gains from water heating, kWh/month	39.6983	34.9534	37.1549	33.1733	32.3825	29.4539	29.4800	30.6468	30.9280	34.0984	35.6885	39.3763	(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	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	142.8972	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	155.5851	172.2549	155.5851	160.7713	155.5851	160.7713	155.5851	155.5851	160.7713	155.5851	160.7713	155.5851	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.4451	286.3864	278.9745	263.1954	243.2771	224.5568	212.0504	209.1092	216.5211	232.3002	252.2184	270.9388	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	37.2897	(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)	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	(71)
Water heating gains (Table 5)	53.3579	52.0140	49.9393	46.0740	43.5248	40.9081	39.6236	41.1920	42.9555	45.8312	49.5674	52.9251	(72)
Total internal gains	558.2573	576.5245	550.3681	535.9099	508.2562	492.1054	473.1283	471.7554	486.1170	499.5856	528.4262	545.3181	(73)

6. Solar gains													

[Jan]			Area	Solar flux	g			FF		Access		Gains	
			m2	Table 6a	Specific data			Specific data		factor		W	
				W/m2	or Table 6b			or Table 6c		Table 6d			
North			5.2000	10.6334	0.6300			0.7000		0.7700		16.8985	(74)
South			1.3000	46.7521	0.6300			0.7000		0.7700		18.5745	(78)
West			8.1000	19.6403	0.6300			0.7000		0.7700		48.6188	(80)
South			0.8000	43.9921	0.6300			0.7000		1.0000		13.9684	(82)
Solar gains	98.0601	183.3103	288.7760	412.8241	506.3786	520.3975	494.4835	423.0860	332.0616	213.3421	120.5455	81.8489	(83)
Total gains	656.3174	759.8347	839.1441	948.7340	1014.6348	1012.5029	967.6119	894.8414	818.1786	712.9277	648.9717	627.1671	(84)

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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	29.7368	29.8374	29.9366	30.4116	30.5022	30.9310	30.9310	31.0117	30.7644	30.5022	30.3196	30.1309
alpha	2.9825	2.9892	2.9958	3.0274	3.0335	3.0621	3.0621	3.0674	3.0510	3.0335	3.0213	3.0087
util living area	0.9834	0.9733	0.9558	0.9103	0.8270	0.6874	0.5482	0.5994	0.7983	0.9333	0.9739	0.9854 (86)
MIT	18.5169	18.7883	19.2174	19.8332	20.3697	20.7599	20.9130	20.8840	20.5887	19.8875	19.1159	18.4895 (87)
Th 2	19.9421	19.9453	19.9484	19.9631	19.9658	19.9787	19.9787	19.9811	19.9737	19.9658	19.9603	19.9545 (88)
util rest of house	0.9803	0.9684	0.9471	0.8917	0.7882	0.6142	0.4417	0.4945	0.7397	0.9157	0.9682	0.9828 (89)
MIT 2	17.6738	17.9447	18.3706	18.9803	19.4861	19.8325	19.9419	19.9282	19.6973	19.0440	18.2820	17.6549 (90)
Living area fraction	fLA = Living area / (4) =											0.4303 (91)
MIT	18.0365	18.3077	18.7349	19.3472	19.8663	20.2316	20.3597	20.3394	20.0808	19.4069	18.6408	18.0140 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.0365	18.3077	18.7349	19.3472	19.8663	20.2316	20.3597	20.3394	20.0808	19.4069	18.6408	18.0140 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9725	0.9580	0.9342	0.8783	0.7840	0.6338	0.4835	0.5338	0.7466	0.9037	0.9584	0.9757 (94)
Useful gains	638.2733	727.9554	783.9538	833.2467	795.4514	641.7042	467.8381	477.6251	610.8731	644.2979	621.9993	611.9533 (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	1910.9242	1858.8938	1690.6794	1421.0967	1107.5277	753.1751	502.8348	525.4944	804.2164	1194.4151	1574.6175	1896.5702 (97)
Space heating kWh	946.8522	759.9906	674.6039	423.2520	232.1848	0.0000	0.0000	0.0000	0.0000	409.2872	685.8851	955.7550 (98a)
Space heating requirement - total per year (kWh/year)												5087.8107
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	946.8522	759.9906	674.6039	423.2520	232.1848	0.0000	0.0000	0.0000	0.0000	409.2872	685.8851	955.7550 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5087.8107
Space heating per m2												(98c) / (4) = 42.8808 (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	1257.1752	989.6911	1013.7935	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7012	0.7759	0.7373	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	881.5712	767.9249	747.4863	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1099.5028	1050.8195	970.1660	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	156.9107	210.4736	165.6737	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	39.2277	52.6184	41.4184	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												133.2645 (107)
Energy for space heating												42.8808 (99)
Energy for space cooling												1.1232 (108)
Total												44.0040 (109)
Fabric Energy Efficiency (TFEE)												44.0 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF ENERGY RATING

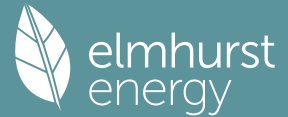
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	66.6500 (1b)	x 2.6600 (2b)	= 177.2890 (1b) - (3b)
First floor	52.0000 (1c)	x 2.7500 (2c)	= 143.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	320.2890 (5)

2. Ventilation rate

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

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.0937 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3437 (18)
Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3437 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate													
	0.4382	0.4296	0.4210	0.3780	0.3694	0.3265	0.3265	0.3179	0.3437	0.3694	0.3866	0.4038	(22b)
Effective ac	0.5960	0.5923	0.5886	0.5715	0.5682	0.5533	0.5533	0.5505	0.5591	0.5682	0.5747	0.5815	(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								
Windows			14.6000	1.3258	19.3561			(27)
Doors			1.7000	1.4000	2.3800			(26a)
Rooflights			0.8000	1.3258	1.0606			(27a)
Ground Floor			65.8000	0.1100	7.2380	110.0000	7238.0000	(28a)
Cavity Walls	121.4700	13.7000	107.7700	0.1900	20.4763	60.0000	6466.2000	(29a)
Dormer Walls	17.4100	2.6000	14.8100	0.1700	2.5177	18.0000	266.5800	(29a)
Sloped Roof	103.2000	0.8000	102.4000	0.1043	10.6768	9.0000	921.6000	(30)
Total net area of external elements Aum(A, m2)			307.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.7054			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14892.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 125.5152 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	34.8000	0.0990	3.4452	
E6 Intermediate floor within a dwelling	36.2000	0.0020	0.0724	
E16 Corner (normal)	24.0500	0.0510	1.2266	
E2 Other lintels (including other steel lintels)	6.9500	0.0150	0.1042	
E2 Other lintels (including other steel lintels)	2.2000	1.0000	2.2000	
E3 Sill	6.9500	0.0210	0.1460	
E3 Sill	2.2000	0.1000	0.2200	
E4 Jamb	13.9000	0.0160	0.2224	
E4 Jamb	4.4000	0.1000	0.4400	
E17 Corner (inverted - internal area greater than external area)	10.7000	-0.0910	-0.9737	
E11 Eaves (insulation at rafter level)	18.8000	0.0180	0.3384	
E13 Gable (insulation at rafter level)	23.2000	0.0610	1.4152	
R1 Head of roof window	1.2000	0.2400	0.2880	
R2 Sill of roof window	1.2000	0.2400	0.2880	
R3 Jamb of roof window	2.4000	0.2400	0.5760	
E16 Corner (normal)	8.6000	0.1800	1.5480	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5567 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 75.2621 (37)

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

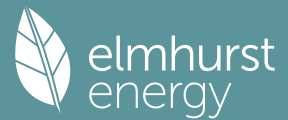
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	62.9942	62.6002	62.2140	60.4001	60.0607	58.4808	58.4808	58.1882	59.0893	60.0607	60.7472	61.4650	(38)
Heat transfer coeff	138.2563	137.8623	137.4761	135.6621	135.3228	133.7428	133.7428	133.4503	134.3514	135.3228	136.0093	136.7271	(39)
Average = Sum(39)m / 12 =												135.6605	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1652	1.1619	1.1587	1.1434	1.1405	1.1272	1.1272	1.1247	1.1323	1.1405	1.1463	1.1524	(40)
HLP (average)												1.1434	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8579 (42)
Hot water usage for mixer showers													
	72.1381	71.0541	69.4743	66.4518	64.2212	61.7337	60.3198	61.8876	63.6062	66.2770	69.3645	71.8618	(42a)
Hot water usage for baths													
	31.1450	30.6824	30.0311	28.8301	27.9308	26.9336	26.3950	27.0418	27.7461	28.8131	30.0388	31.0397	(42b)
Hot water usage for other uses													
	43.8982	42.3019	40.7056	39.1093	37.5130	35.9167	35.9167	37.5130	39.1093	40.7056	42.3019	43.8982	(42c)
Average daily hot water use (litres/day)													135.2927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	147.1813	144.0384	140.2110	134.3912	129.6650	124.5840	122.6315	126.4424	130.4615	135.7957	141.7052	146.7997	(44)
Energy conte	233.0993	205.1088	215.4991	183.9748	174.5540	153.1906	148.3122	156.5621	160.8721	184.2734	201.8850	229.8528	(45)
Energy content (annual)													Total = Sum(45)m = 2247.1840
Distribution loss (46)m = 0.15 x (45)m													
	34.9649	30.7663	32.3249	27.5962	26.1831	22.9786	22.2468	23.4843	24.1308	27.6410	30.2827	34.4779	(46)
Water storage loss:													
Store volume													191.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2200 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6588 (55)
Total storage loss													
	20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	(56)
If cylinder contains dedicated solar storage													
	20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	(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													
	276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	273.5380	(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													

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276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	273.5380 (64)
Total per year (kWh/year) = Sum(64)m =											2761.5420 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	112.4537	99.7647	106.6016	94.9924	92.9874	84.7567	84.2620	87.0051	87.3108	96.2191	111.3742 (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	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.5093	40.4209	32.8725	24.8866	18.6030	15.7055	16.9703	22.0586	29.6071	37.5930	43.8765	46.7741 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	423.0524	427.4424	416.3798	392.8290	363.1002	335.1594	316.4932	312.1032	323.1658	346.7167	376.4454	404.3862 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056 (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)	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178 (71)
Water heating gains (Table 5)	151.1474	148.4594	143.2817	131.9339	124.9830	117.7176	113.2553	116.9423	121.2650	129.3267	140.2049	149.6965 (72)
Total internal gains	731.8736	728.4873	704.6986	661.8140	618.8507	580.7469	558.8833	563.2686	586.2023	625.8008	672.6914	713.0214 (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				5.2000	10.6334	0.7200	0.7000	0.7700	19.3125 (74)			
South				1.3000	46.7521	0.7200	0.7000	0.7700	21.2279 (78)			
West				8.1000	19.6403	0.7200	0.7000	0.7700	55.5643 (80)			
South				0.8000	43.9921	0.6300	0.7000	1.0000	13.9684 (82)			
Solar gains	110.0732	205.8563	324.5268	464.3063	569.8547	585.7715	556.5449	475.9710	373.2936	239.6431	135.3291	91.8659 (83)
Total gains	841.9468	934.3436	1029.2253	1126.1203	1188.7054	1166.5185	1115.4282	1039.2396	959.4959	865.4439	808.0205	804.8873 (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	29.9210	30.0065	30.0908	30.4932	30.5697	30.9308	30.9308	30.9986	30.7907	30.5697	30.4154	30.2557
alpha	2.9947	3.0004	3.0061	3.0329	3.0380	3.0621	3.0621	3.0666	3.0527	3.0380	3.0277	3.0170
util living area												
	0.9685	0.9554	0.9286	0.8718	0.7734	0.6280	0.4896	0.5362	0.7401	0.8977	0.9549	0.9721 (86)
Living	18.7849	19.0300	19.4580	20.0151	20.4932	20.8148	20.9364	20.9149	20.6751	20.0580	19.3309	18.7449
Non living	17.3735	17.6845	18.2237	18.9186	19.4844	19.8381	19.9453	19.9327	19.7034	18.9865	18.0771	17.3292
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	19.8668	19.0300	19.4580	20.0151	20.4932	20.8148	20.9364	20.9149	20.6751	20.0580	19.3309	19.0604 (87)
Th 2	19.9479	19.9506	19.9532	19.9656	19.9679	19.9787	19.9787	19.9807	19.9745	19.9679	19.9632	19.9583 (88)
util rest of house												
	0.9630	0.9477	0.9158	0.8478	0.7291	0.5541	0.3896	0.4359	0.6756	0.8734	0.9457	0.9673 (89)
MIT 2	18.9216	17.6845	18.2237	18.9186	19.4844	19.8381	19.9453	19.9327	19.7034	18.9865	18.0771	17.8030 (90)
Living area fraction									fLA =	Living area / (4) =		0.4303 (91)
MIT	19.3283	18.2634	18.7547	19.3904	19.9185	20.2584	20.3717	20.3553	20.1215	19.4475	18.6166	18.3440 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3283	18.2634	18.7547	19.3904	19.9185	20.2584	20.3717	20.3553	20.1215	19.4475	18.6166	18.3440 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9591	0.9312	0.8973	0.8320	0.7268	0.5756	0.4295	0.4745	0.6858	0.8584	0.9299	0.9573 (94)
Ext temp.	807.5351	870.0405	923.5116	936.9810	863.9161	671.3908	479.1037	493.0973	657.9837	742.9189	751.3542	770.4948 (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	2077.7539	1842.3131	1684.7353	1423.1475	1112.1451	756.7674	504.4415	527.8403	808.9956	1197.2718	1566.3586	1933.8659 (97)
Space heating requirement - total per year (kWh/year)	945.0428	653.3672	566.3504	350.0399	184.6824	0.0000	0.0000	0.0000	0.0000	338.0386	586.8031	865.5481 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	945.0428	653.3672	566.3504	350.0399	184.6824	0.0000	0.0000	0.0000	0.0000	338.0386	586.8031	865.5481 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	945.0428	653.3672	566.3504	350.0399	184.6824	0.0000	0.0000	0.0000	0.0000	338.0386	586.8031	865.5481 (98c)
Space heating per m ²	(98c) / (4) =											37.8413 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)										
Fraction of space heat from main system(s)	1.0000 (202)										
Efficiency of main space heating system 1 (in %)	305.9547 (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

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Space heating requirement	945.0428	653.3672	566.3504	350.0399	184.6824	0.0000	0.0000	0.0000	0.0000	338.0386	586.8031	865.5481 (98)
Space heating efficiency (main heating system 1)	305.9547	305.9547	305.9547	305.9547	305.9547	0.0000	0.0000	0.0000	0.0000	305.9547	305.9547	305.9547 (210)
Space heating fuel (main heating system)	308.8833	213.5503	185.1092	114.4091	60.3627	0.0000	0.0000	0.0000	0.0000	110.4865	191.7941	282.9008 (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	276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	273.5380 (64)
Efficiency of water heater	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433 (216)
Fuel for water heating, kWh/month	148.7742	131.4567	139.3140	121.6119	117.3056	105.0651	103.2004	107.6348	109.1940	122.5299	131.2388	147.0292 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.8340	31.9563	28.7731	21.0804	16.2831	13.3034	14.8540	19.3078	25.0789	32.9049	37.1660	40.9411 (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												1467.4959 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												186.0433
Water heating fuel used												1484.3546 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												321.4831 (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												3273.3336 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1467.4959	16.4900	241.9901 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1484.3546	16.4900	244.7701 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	321.4831	16.4900	53.0126 (250)
Additional standing charges			0.0000 (251)
Total energy cost			539.7727 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		1.1874 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	80.7522
SAP rating (Section 12)		81 (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	1467.4959	0.1549	227.2660 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1484.3546	0.1410	209.3599 (264)
Space and water heating			436.6259 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	321.4831	0.1443	46.3999 (268)
Total CO2, kg/year			483.0258 (272)
CO2 emissions per m2			4.0700 (273)
EI value			96.0449
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	66.6500 (1b)	x 2.6600 (2b)	= 177.2890 (1b) - (3b)
First floor	52.0000 (1c)	x 2.7500 (2c)	= 143.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 320.2890 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.0937 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3437 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3437 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.3694	0.3523	0.3523	0.3265	0.3351	0.2921	0.2921	0.2835	0.2921	0.3265	0.3179	0.3437 (22b)
Effective ac	0.5682	0.5620	0.5620	0.5533	0.5561	0.5427	0.5427	0.5402	0.5427	0.5533	0.5505	0.5591 (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							
Windows			14.6000	1.3258	19.3561		(27)
Doors			1.7000	1.4000	2.3800		(26a)
Rooflights			0.8000	1.3258	1.0606		(27a)
Ground Floor			65.8000	0.1100	7.2380	110.0000	7238.0000 (28a)
Cavity Walls	121.4700	13.7000	107.7700	0.1900	20.4763	60.0000	6466.2000 (29a)
Dormer Walls	17.4100	2.6000	14.8100	0.1700	2.5177	18.0000	266.5800 (29a)
Sloped Roof	103.2000	0.8000	102.4000	0.1043	10.6768	9.0000	921.6000 (30)
Total net area of external elements Aum(A, m ²)			307.8800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		63.7054		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14892.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 125.5152 (35)

List of Thermal Bridges

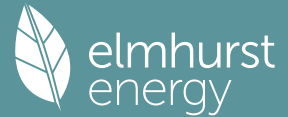
K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.8000	0.0990	3.4452
E6 Intermediate floor within a dwelling	36.2000	0.0020	0.0724
E16 Corner (normal)	24.0500	0.0510	1.2266
E2 Other lintels (including other steel lintels)	6.9500	0.0150	0.1042
E2 Other lintels (including other steel lintels)	2.2000	1.0000	2.2000
E3 Sill	6.9500	0.0210	0.1460
E3 Sill	2.2000	0.1000	0.2200
E4 Jamb	13.9000	0.0160	0.2224
E4 Jamb	4.4000	0.1000	0.4400
E17 Corner (inverted - internal area greater than external area)	10.7000	-0.0910	-0.9737
E11 Eaves (insulation at rafter level)	18.8000	0.0180	0.3384
E13 Gable (insulation at rafter level)	23.2000	0.0610	1.4152
R1 Head of roof window	1.2000	0.2400	0.2880
R2 Sill of roof window	1.2000	0.2400	0.2880
R3 Jamb of roof window	2.4000	0.2400	0.5760
E16 Corner (normal)	8.6000	0.1800	1.5480

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5567 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 75.2621 (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	60.0607	59.4053	59.4053	58.4808	58.7811	57.3573	57.3573	57.0959	57.3573	58.4808	58.1882	59.0893 (39)
Heat transfer coeff	135.3228	134.6674	134.6674	133.7428	134.0432	132.6194	132.6194	132.3580	132.6194	133.7428	133.4503	134.3514 (39)
Average = Sum(39)m / 12 =												133.6837
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1405	1.1350	1.1350	1.1272	1.1297	1.1177	1.1177	1.1155	1.1177	1.1272	1.1247	1.1323 (40)
HLP (average)												1.1267
Days in month	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												2.8579 (42)
Hot water usage for mixer showers												
72.1381	71.0541	69.4743	66.4518	64.2212	61.7337	60.3198	61.8876	63.6062	66.2770	69.3645	71.8618	(42a)
Hot water usage for baths												
31.1450	30.6824	30.0311	28.8301	27.9308	26.9336	26.3950	27.0418	27.7461	28.8131	30.0388	31.0397	(42b)
Hot water usage for other uses												
43.8982	42.3019	40.7056	39.1093	37.5130	35.9167	35.9167	37.5130	39.1093	40.7056	42.3019	43.8982	(42c)
Average daily hot water use (litres/day)												135.2927 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.1813	144.0384	140.2110	134.3912	129.6650	124.5840	122.6315	126.4424	130.4615	135.7957	141.7052	146.7997 (44)
Energy content	233.0993	205.1088	215.4991	183.9748	174.5540	153.1906	148.3122	156.5621	160.8721	184.2734	201.8850	229.8528 (45)
Energy content (annual)												Total = Sum(45)m = 2247.1840
Distribution loss (46)m = 0.15 x (45)m												
34.9649	30.7663	32.3249	27.5962	26.1831	22.9786	22.2468	23.4843	24.1308	27.6410	30.2827	34.4779	(46)
Water storage loss:												
Store volume												191.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6588 (55)
Total storage loss												
20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	(56)
If cylinder contains dedicated solar storage												
20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	273.5380	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	(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												
112.4537	99.7647	106.6016	94.9924	92.9874	84.7567	84.2620	87.0051	87.3108	96.2191	100.9476	111.3742	(65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
45.5093	40.4209	32.8725	24.8866	18.6030	15.7055	16.9703	22.0586	29.6071	37.5930	43.8765	46.7741	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
423.0524	427.4424	416.3798	392.8290	363.1002	335.1594	316.4932	312.1032	323.1658	346.7167	376.4454	404.3862	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	(71)
Water heating gains (Table 5)												
151.1474	148.4594	143.2817	131.9339	124.9830	117.7176	113.2553	116.9423	121.2650	129.3267	140.2049	149.6965	(72)
Total internal gains	731.8736	728.4873	704.6986	661.8140	618.8507	580.7469	558.8833	563.2686	586.2023	625.8008	672.6914	713.0214 (73)

6. Solar gains												
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
North	5.2000	12.7650	0.7200	0.7000	0.7700	23.1841 (74)						
South	1.3000	54.2217	0.7200	0.7000	0.7700	24.6196 (78)						
West	8.1000	23.8018	0.7200	0.7000	0.7700	67.3377 (80)						
South	0.8000	52.3616	0.6300	0.7000	1.0000	16.6258 (82)						
Solar gains	131.7671	215.7972	338.6280	492.8111	589.6601	641.1835	603.1855	528.7442	415.6031	269.9145	159.6882	110.5391 (83)
Total gains	863.6407	944.2845	1043.3266	1154.6250	1208.5108	1221.9305	1162.0688	1092.0128	1001.8054	895.7153	832.3795	823.5604 (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	30.5697	30.7184	30.7184	30.9308	30.8615	31.1928	31.1928	31.2544	31.1928	30.9308	30.9986	30.7907
alpha	3.0380	3.0479	3.0479	3.0621	3.0574	3.0795	3.0795	3.0836	3.0795	3.0621	3.0666	3.0527
util living area	0.9616	0.9475	0.9137	0.8391	0.7118	0.5176	0.3648	0.3959	0.6623	0.8666	0.9424	0.9658 (86)
Living	19.0259	19.2553	19.6856	20.2263	20.6619	20.9140	20.9793	20.9734	20.8011	20.2584	19.5730	18.9916
Non living	17.6912	17.9825	18.5198	19.1814	19.6775	19.9327	19.9794	19.9786	19.8384	19.2345	18.3924	17.6524
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	19.9901	19.2553	19.6856	20.2263	20.6619	20.9140	20.9793	20.9734	20.8011	20.2584	19.5730	19.2725 (87)
Th 2	19.9679	19.9724	19.9724	19.9787	19.9766	19.9864	19.9864	19.9882	19.9864	19.9787	19.9807	19.9745 (88)
util rest of house	0.9548	0.9382	0.8979	0.8087	0.6562	0.4316	0.2578	0.2849	0.5836	0.8344	0.9303	0.9596 (89)
MIT 2	19.0603	17.9825	18.5198	19.1814	19.6775	19.9327	19.9794	19.9786	19.8384	19.2345	18.3924	18.0708 (90)

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Living area fraction									fLA = Living area / (4) =			0.4303 (91)
MIT	19.4603	18.5301	19.0214	19.6310	20.1010	20.3549	20.4096	20.4066	20.2526	19.6751	18.9003	18.5879 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4603	18.5301	19.0214	19.6310	20.1010	20.3549	20.4096	20.4066	20.2526	19.6751	18.9003	18.5879 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9509	0.9213	0.8799	0.7969	0.6635	0.4641	0.3034	0.3320	0.6058	0.8232	0.9139	0.9488	(94)
Useful gains	821.1944	869.9327	917.9852	920.1513	801.8941	567.0908	352.6094	362.5540	606.9127	737.3119	760.6922	781.3777	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1943.2817	1727.7977	1565.0205	1301.4462	965.2519	604.0712	359.3518	371.4803	696.6001	1093.3552	1454.6539	1812.1117	(97)
Space heating kWh	834.8330	576.4853	481.3942	274.5323	121.5382	0.0000	0.0000	0.0000	0.0000	264.8962	499.6524	766.8661	(98a)
Space heating requirement - total per year (kWh/year)												3820.1977	
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	834.8330	576.4853	481.3942	274.5323	121.5382	0.0000	0.0000	0.0000	0.0000	264.8962	499.6524	766.8661	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3820.1977	
Space heating per m2										(98c) / (4) =		32.1972	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													305.5306 (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	834.8330	576.4853	481.3942	274.5323	121.5382	0.0000	0.0000	0.0000	0.0000	264.8962	499.6524	766.8661	(98)
Space heating efficiency (main heating system 1)	305.5306	305.5306	305.5306	305.5306	305.5306	0.0000	0.0000	0.0000	0.0000	305.5306	305.5306	305.5306	(210)
Space heating fuel (main heating system)	273.2404	188.6833	157.5601	89.8543	39.7794	0.0000	0.0000	0.0000	0.0000	86.7004	163.5360	250.9949	(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	276.7845	244.5664	259.1843	226.2508	218.2392	195.4666	191.9974	200.2473	203.1481	227.9586	244.1610	273.5380	(64)
Efficiency of water heater	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	(216)
Fuel for water heating, kWh/month	148.6808	131.3741	139.2264	121.5355	117.2319	104.9991	103.1355	107.5672	109.1254	122.4529	131.1563	146.9368	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	39.8340	31.9563	28.7731	21.0804	16.2831	13.3034	14.8540	19.3078	25.0789	32.9049	37.1660	40.9411	(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												1250.3485	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												186.1602	
Water heating fuel used												1483.4220	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												321.4831	(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												3055.2537	(238)

10a. Fuel costs - using BEDF prices (570)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1250.3485	26.0600	325.8408	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1483.4220	26.0600	386.5798	(247)

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Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	321.4831	26.0600	83.7785 (250)
Additional standing charges			0.0000 (251)
Total energy cost			796.1991 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1250.3485	0.1554	194.3316 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1483.4220	0.1410	209.2283 (264)
Space and water heating			403.5599 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	321.4831	0.1443	46.3999 (268)
Total CO2, kg/year			449.9598 (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	1250.3485	1.5754	1969.7688 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1483.4220	1.5215	2257.0832 (278)
Space and water heating			4226.8519 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	321.4831	1.5338	493.1015 (282)
Total Primary energy kWh/year			4719.9535 (286)

SAP 10 EPC IMPROVEMENTS

Baseline

Current energy efficiency rating:	B 81
Current environmental impact rating:	A 96

N Solar water heating			Recommended
U Solar photovoltaic panels			Recommended
V2 Wind turbine			Not applicable
Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.7	-£ 86	-41 kg (9.2%)
U Solar photovoltaic panels	+ 5.4	-£ 249	-129 kg (31.4%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£86	0.35 kg/m²	B 82 A 96
Solar photovoltaic panels	£249	1.08 kg/m²	B 88 A 97
Total Savings	£335	1.43 kg/m²	

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	A 97

Fuel prices for cost data on this page from database revision number 570 TEST (02 May 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

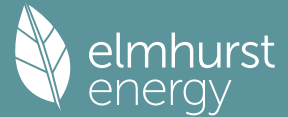
	Current £796	Potential £710	Saving £86
Electricity			
Space heating	£326	£347	-£21
Water heating	£387	£279	£108
Lighting	£84	£84	£0
Generated (PV)	-£0	-£249	£249
Total cost of fuels	£796	£461	£335
Total cost of uses	£797	£461	£336
Delivered energy	26 kWh/m²	15 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.3 tonnes	0.2 tonnes
CO2 emissions per m²	4 kg/m²	2 kg/m²	1 kg/m²
Primary energy	40 kWh/m²	24 kWh/m²	16 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	66.6500 (1b)	x 2.6600 (2b)	= 177.2890 (1b) - (3b)
First floor	52.0000 (1c)	x 2.7500 (2c)	= 143.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6500		(4)

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Dwelling volume

(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 320.2890 (5)

2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												3 * 10 = 30.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans												30.0000 / (5) = 0.0937 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												5.0000 (17)
Infiltration rate												0.3437 (18)
Number of sides sheltered												0 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3437 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	(22)
Adj infilt rate													(22a)
Effective ac	0.4382	0.4296	0.4210	0.3780	0.3694	0.3265	0.3265	0.3179	0.3437	0.3694	0.3866	0.4038	(22b)
	0.5960	0.5923	0.5886	0.5715	0.5682	0.5533	0.5533	0.5505	0.5591	0.5682	0.5747	0.5815	(25)

3. Heat losses and heat loss parameter

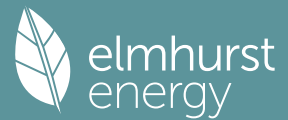
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			14.6000	1.3258	19.3561			(27)
Doors			1.7000	1.4000	2.3800			(26a)
Rooflights			0.8000	1.3258	1.0606			(27a)
Ground Floor			65.8000	0.1100	7.2380	110.0000	7238.0000	(28a)
Cavity Walls	121.4700	13.7000	107.7700	0.1900	20.4763	60.0000	6466.2000	(29a)
Dormer Walls	17.4100	2.6000	14.8100	0.1700	2.5177	18.0000	266.5800	(29a)
Sloped Roof	103.2000	0.8000	102.4000	0.1043	10.6768	9.0000	921.6000	(30)
Total net area of external elements Aum(A, m2)			307.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.7054			(33)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 14892.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								125.5152 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E5 Ground floor (normal)				34.8000	0.0990	3.4452		
E6 Intermediate floor within a dwelling				36.2000	0.0020	0.0724		
E16 Corner (normal)				24.0500	0.0510	1.2266		
E2 Other lintels (including other steel lintels)				6.9500	0.0150	0.1042		
E2 Other lintels (including other steel lintels)				2.2000	1.0000	2.2000		
E3 Sill				6.9500	0.0210	0.1460		
E3 Sill				2.2000	0.1000	0.2200		
E4 Jamb				13.9000	0.0160	0.2224		
E4 Jamb				4.4000	0.1000	0.4400		
E17 Corner (inverted - internal area greater than external area)				10.7000	-0.0910	-0.9737		
E11 Eaves (insulation at rafter level)				18.8000	0.0180	0.3384		
E13 Gable (insulation at rafter level)				23.2000	0.0610	1.4152		
R1 Head of roof window				1.2000	0.2400	0.2880		
R2 Sill of roof window				1.2000	0.2400	0.2880		
R3 Jamb of roof window				2.4000	0.2400	0.5760		
E16 Corner (normal)				8.6000	0.1800	1.5480		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5567	(36)
Point Thermal bridges							(36a) = 0.0000	
Total fabric heat loss							(33) + (36) + (36a) = 75.2621	(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	62.9942	62.6002	62.2140	60.4001	60.0607	58.4808	58.4808	58.1882	59.0893	60.0607	60.7472	61.4650	(39)
Average = Sum(39)m / 12 =	138.2563	137.8623	137.4761	135.6621	135.3228	133.7428	133.7428	133.4503	134.3514	135.3228	136.0093	136.7271	(39)
													135.6605
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1652	1.1619	1.1587	1.1434	1.1405	1.1272	1.1272	1.1247	1.1323	1.1405	1.1463	1.1524	(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													2.8579 (42)
Hot water usage for mixer showers													
	72.1381	71.0541	69.4743	66.4518	64.2212	61.7337	60.3198	61.8876	63.6062	66.2770	69.3645	71.8618	(42a)
Hot water usage for baths													
	31.1450	30.6824	30.0311	28.8301	27.9308	26.9336	26.3950	27.0418	27.7461	28.8131	30.0388	31.0397	(42b)
Hot water usage for other uses													
	43.8982	42.3019	40.7056	39.1093	37.5130	35.9167	35.9167	37.5130	39.1093	40.7056	42.3019	43.8982	(42c)
Average daily hot water use (litres/day)													135.2927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	147.1813	144.0384	140.2110	134.3912	129.6650	124.5840	122.6315	126.4424	130.4615	135.7957	141.7052	146.7997	(44)
	233.0993	205.1088	215.4991	183.9748	174.5540	153.1906	148.3122	156.5621	160.8721	184.2734	201.8850	229.8528	(45)

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Energy content (annual)											Total = Sum(45)m =	2247.1840
Distribution loss (46)m = 0.15 x (45)m												
34.9649	30.7663	32.3249	27.5962	26.1831	22.9786	22.2468	23.4843	24.1308	27.6410	30.2827	34.4779	(46)
Water storage loss:												
Store volume											191.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):											1.2200	(48)
Temperature factor from Table 2b											0.5400	(49)
Enter (49) or (54) in (55)											0.6588	(55)
Total storage loss												
20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	(56)
If cylinder contains dedicated solar storage												
20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
276.7845	244.5664	257.7885	219.4972	205.4449	182.8599	178.9704	188.1508	197.7452	226.5629	244.1610	273.5380	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector											3.0000	(H1)
Zero-loss collector efficiency											0.8000	(H2)
Collector linear heat loss coefficient											1.8000	(H3)
Collector 2nd order heat loss coefficient											0.0000	(H4)
Collector loop efficiency											0.9000	(H5)
Incidence angle modifier											1.0000	(H6)
Overshading factor											0.8000	(H8)
Overall heat loss coefficient of system											6.5000	(H10)
Heat loss coefficient of collector loop											3.9667	(H11)
Dedicated solar storage volume											75.0000	(H12)
Effective solar volume											75.0000	(H14)
Reference volume											225.0000	(H15)
Storage tank correction coefficient											1.3161	(H16)
Heat delivered to hot water											622.9586	(H24)
Heat delivered to space heating											0.0000	(H29)
Solar input											622.9586	
Solar input	-0.0000	-16.2042	-58.4792	-80.4133	-104.9898	-96.6367	-95.8267	-83.8548	-57.8666	-28.6874	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	276.7845	228.3622	199.3094	139.0839	100.4551	86.2232	83.1437	104.2961	139.8786	197.8755	244.1610	(64)
										Total per year (kWh/year) = Sum(64)m =	2073.1110	(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	112.4537	99.7647	105.4850	89.5895	82.7519	74.6713	73.8404	77.3279	82.9885	95.1025	100.9476	(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	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.5093	40.4209	32.8725	24.8866	18.6030	15.7055	16.9703	22.0586	29.6071	37.5930	43.8765	46.7741 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	423.0524	427.4424	416.3798	392.8290	363.1002	335.1594	316.4932	312.1032	323.1658	346.7167	376.4454	404.3862 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056 (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)	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178 (71)
Water heating gains (Table 5)	151.1474	148.4594	141.7809	124.4299	111.2257	103.7101	99.2479	103.9353	115.2618	127.8259	140.2049	149.6965 (72)
Total internal gains	731.8736	728.4873	703.1978	654.3100	605.0934	566.7395	544.8758	550.2617	580.1991	624.3000	672.6914	713.0214 (73)

6. Solar gains

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

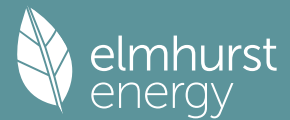
North				5.2000	10.6334	0.7200	0.7000	0.7700	19.3125 (74)			
South				1.3000	46.7521	0.7200	0.7000	0.7700	21.2279 (78)			
West				8.1000	19.6403	0.7200	0.7000	0.7700	55.5643 (80)			
South				0.8000	43.9921	0.6300	0.7000	1.0000	13.9684 (82)			

Solar gains	110.0732	205.8563	324.5268	464.3063	569.8547	585.7715	556.5449	475.9710	373.2936	239.6431	135.3291	91.8659 (83)
Total gains	841.9468	934.3436	1027.7245	1118.6163	1174.9481	1152.5110	1101.4207	1026.2327	953.4927	863.9431	808.0205	804.8873 (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	29.9210	30.0065	30.0908	30.4932	30.5697	30.9308	30.9308	30.9986	30.7907	30.5697	30.4154	30.2557
alpha	2.9947	3.0004	3.0061	3.0329	3.0380	3.0621	3.0621	3.0666	3.0527	3.0380	3.0277	3.0170
util living area	0.9685	0.9554	0.9289	0.8735	0.7776	0.6331	0.4947	0.5414	0.7425	0.8981	0.9549	0.9721 (86)
Living	18.7849	19.0300	19.4562	20.0081	20.4846	20.8105	20.9346	20.9126	20.6719	20.0565	19.3309	18.7449
Non living	17.3735	17.6845	18.2216	18.9105	19.4754	19.8345	19.9442	19.9313	19.7004	18.9847	18.0771	17.3292
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	19.8668	19.0300	19.4562	20.0081	20.4846	20.8105	20.9346	20.9126	20.6719	20.0565	19.3309	19.0604 (87)
Th 2	19.9479	19.9506	19.9532	19.9656	19.9679	19.9787	19.9787	19.9807	19.9745	19.9679	19.9632	19.9583 (88)
util rest of house	0.9630	0.9477	0.9161	0.8497	0.7336	0.5592	0.3940	0.4406	0.6782	0.8738	0.9457	0.9673 (89)
MIT 2	18.9216	17.6845	18.2216	18.9105	19.4754	19.8345	19.9442	19.9313	19.7004	18.9847	18.0771	17.8030 (90)
Living area fraction	fLA = Living area / (4) = 0.4303 (91)											
MIT	19.3283	18.2634	18.7528	19.3828	19.9096	20.2544	20.3703	20.3535	20.1184	19.4458	18.6166	18.3440 (92)
Temperature adjustment	0.0000											

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adjusted MIT 19.3283 18.2634 18.7528 19.3828 19.9096 20.2544 20.3703 20.3535 20.1184 19.4458 18.6166 18.3440 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9591	0.9312	0.8976	0.8338	0.7309	0.5804	0.4341	0.4793	0.6881	0.8588	0.9299	0.9573	(94)
Useful gains	807.5351	870.0405	922.4507	932.7566	858.7684	668.9045	478.1690	491.8829	656.1236	741.9933	751.3542	770.4948	(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	2077.7539	1842.3131	1684.4695	1422.1143	1110.9509	756.2419	504.2541	527.5942	808.5781	1197.0445	1566.3586	1933.8659	(97)
Space heating kWh	945.0428	653.3672	566.9420	352.3375	187.6238	0.0000	0.0000	0.0000	0.0000	338.5581	586.8031	865.5481	(98a)
Space heating requirement - total per year (kWh/year)												4496.2226	
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	945.0428	653.3672	566.9420	352.3375	187.6238	0.0000	0.0000	0.0000	0.0000	338.5581	586.8031	865.5481	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4496.2226	
Space heating per m2											(98c) / (4) =	37.8948	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													305.9547 (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	945.0428	653.3672	566.9420	352.3375	187.6238	0.0000	0.0000	0.0000	0.0000	338.5581	586.8031	865.5481	(98)
Space heating efficiency (main heating system 1)	305.9547	305.9547	305.9547	305.9547	305.9547	0.0000	0.0000	0.0000	0.0000	305.9547	305.9547	305.9547	(210)
Space heating fuel (main heating system)	308.8833	213.5503	185.3026	115.1600	61.3240	0.0000	0.0000	0.0000	0.0000	110.6563	191.7941	282.9008	(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	276.7845	228.3622	199.3094	139.0839	100.4551	86.2232	83.1437	104.2961	139.8786	197.8755	244.1610	273.5380	(64)
Efficiency of water heater	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	186.0433	(216)
Fuel for water heating, kWh/month	148.7742	122.7468	107.1306	74.7589	53.9956	46.3457	44.6905	56.0601	75.1860	106.3599	131.2388	147.0292	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	39.8340	31.9563	28.7731	21.0804	16.2831	13.3034	14.8540	19.3078	25.0789	32.9049	37.1660	40.9411	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-39.2607	-58.7599	-88.9311	-103.0001	-110.4303	-97.7116	-96.3101	-90.5501	-79.7876	-68.0082	-43.9625	-33.3672	(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												1469.5714	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												186.0433	
Water heating fuel used												1114.3165	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												321.4831	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-910.0795	(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												2075.2915	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1469.5714	16.4900	242.3323	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1114.3165	16.4900	183.7508	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)

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Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	321.4831	16.4900	53.0126 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-910.0795	16.4900	-150.0721
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-150.0721 (252)
Total energy cost			342.2156 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7528 (257)
SAP value		87.7969
SAP rating (Section 12)		88 (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	1469.5714	0.1548	227.5530 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1114.3165	0.1457	162.3199 (264)
Space and water heating			389.8729 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	321.4831	0.1443	46.3999 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-910.0795	0.1344	-122.3312
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-122.3312 (269)
Total CO2, kg/year			325.0387 (272)
CO2 emissions per m2			2.7400 (273)
EI value			97.3385
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	66.6500 (1b)	x 2.6600 (2b)	= 177.2890 (1b) - (3b)
First floor	52.0000 (1c)	x 2.7500 (2c)	= 143.0000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	320.2890 (5)

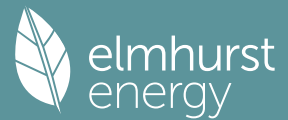
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.0937 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3437 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3437 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infiltr rate	0.3694	0.3523	0.3523	0.3265	0.3351	0.2921	0.2921	0.2835	0.2921	0.3265	0.3179	0.3437 (22b)
Effective ac	0.5682	0.5620	0.5620	0.5533	0.5561	0.5427	0.5427	0.5402	0.5427	0.5533	0.5505	0.5591 (25)

3. Heat losses and heat loss parameter

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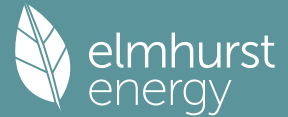


Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
Windows			14.6000	1.3258	19.3561			(27)					
Doors			1.7000	1.4000	2.3800			(26a)					
Rooflights			0.8000	1.3258	1.0606			(27a)					
Ground Floor			65.8000	0.1100	7.2380	110.0000	7238.0000	(28a)					
Cavity Walls	121.4700	13.7000	107.7700	0.1900	20.4763	60.0000	6466.2000	(29a)					
Dormer Walls	17.4100	2.6000	14.8100	0.1700	2.5177	18.0000	266.5800	(29a)					
Sloped Roof	103.2000	0.8000	102.4000	0.1043	10.6768	9.0000	921.6000	(30)					
Total net area of external elements Aum(A, m2)			307.8800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.7054			(33)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14892.3800	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							125.5152	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E5 Ground floor (normal)				34.8000	0.0990	3.4452							
E6 Intermediate floor within a dwelling				36.2000	0.0020	0.0724							
E16 Corner (normal)				24.0500	0.0510	1.2266							
E2 Other lintels (including other steel lintels)				6.9500	0.0150	0.1042							
E2 Other lintels (including other steel lintels)				2.2000	1.0000	2.2000							
E3 Sill				6.9500	0.0210	0.1460							
E3 Sill				2.2000	0.1000	0.2200							
E4 Jamb				13.9000	0.0160	0.2224							
E4 Jamb				4.4000	0.1000	0.4400							
E17 Corner (inverted - internal area greater than external area)				10.7000	-0.0910	-0.9737							
E11 Eaves (insulation at rafter level)				18.8000	0.0180	0.3384							
E13 Gable (insulation at rafter level)				23.2000	0.0610	1.4152							
R1 Head of roof window				1.2000	0.2400	0.2880							
R2 Sill of roof window				1.2000	0.2400	0.2880							
R3 Jamb of roof window				2.4000	0.2400	0.5760							
E16 Corner (normal)				8.6000	0.1800	1.5480							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5567	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	75.2621	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 60.0607	Feb 59.4053	Mar 59.4053	Apr 58.4808	May 58.7811	Jun 57.3573	Jul 57.3573	Aug 57.0959	Sep 57.3573	Oct 58.4808	Nov 58.1882	Dec 59.0893	(38)
Heat transfer coeff	135.3228	134.6674	134.6674	133.7428	134.0432	132.6194	132.6194	132.3580	132.6194	133.7428	133.4503	134.3514	(39)
Average = Sum(39)m / 12 =												133.6837	
HLP	Jan 1.1405	Feb 1.1350	Mar 1.1350	Apr 1.1272	May 1.1297	Jun 1.1177	Jul 1.1177	Aug 1.1155	Sep 1.1177	Oct 1.1272	Nov 1.1247	Dec 1.1323	(40)
HLP (average)												1.1267	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.8579 (42)
Hot water usage for mixer showers													
72.1381	71.0541	69.4743	66.4518	64.2212	61.7337	60.3198	61.8876	63.6062	66.2770	69.3645	71.8618	71.8618	(42a)
Hot water usage for baths													
31.1450	30.6824	30.0311	28.8301	27.9308	26.9336	26.3950	27.0418	27.7461	28.8131	30.0388	31.0397	31.0397	(42b)
Hot water usage for other uses													
43.8982	42.3019	40.7056	39.1093	37.5130	35.9167	35.9167	37.5130	39.1093	40.7056	42.3019	43.8982	43.8982	(42c)
Average daily hot water use (litres/day)													135.2927 (43)
Daily hot water use	Jan 147.1813	Feb 144.0384	Mar 140.2110	Apr 134.3912	May 129.6650	Jun 124.5840	Jul 122.6315	Aug 126.4424	Sep 130.4615	Oct 135.7957	Nov 141.7052	Dec 146.7997	(44)
Energy conte	233.0993	205.1088	215.4991	183.9748	174.5540	153.1906	148.3122	156.5621	160.8721	184.2734	201.8850	229.8528	(45)
Energy content (annual)										Total = Sum(45)m =		2247.1840	
Distribution loss (46)m = 0.15 x (45)m													
34.9649	30.7663	32.3249	27.5962	26.1831	22.9786	22.2468	23.4843	24.1308	27.6410	30.2827	34.4779	34.4779	(46)
Water storage loss:													
Store volume													191.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2200 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6588 (55)
Total storage loss													
20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	(56)
If cylinder contains dedicated solar storage													
20.4228	18.4464	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	19.7640	20.4228	19.7640	20.4228	20.4228	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
276.7845	244.5664	257.7885	219.4972	205.4449	182.8599	178.9704	188.1508	197.7452	226.5629	244.1610	273.5380	273.5380	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													702.6158 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													702.6158
Solar input	-0.8782	-19.6060	-63.2276	-87.5104	-109.8895	-107.5051	-105.3900	-96.0083	-68.5297	-38.5794	-5.4915	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
275.9062	224.9603	194.5609	131.9868	95.5553	75.3548	73.5805	92.1426	129.2155	187.9835	238.6694	273.5380	273.5380	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
112.4537	99.7647	105.4850	89.5895	82.7519	74.6713	73.8404	77.3279	82.9885	95.1025	100.9476	111.3742	111.3742	(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	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766	171.4766 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.5093	40.4209	32.8725	24.8866	18.6030	15.7055	16.9703	22.0586	29.6071	37.5930	43.8765	46.7741 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	423.0524	427.4424	416.3798	392.8290	363.1002	335.1594	316.4932	312.1032	323.1658	346.7167	376.4454	404.3862 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056	55.0056 (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)	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178	-114.3178 (71)
Water heating gains (Table 5)	151.1474	148.4594	141.7809	124.4299	111.2257	103.7101	99.2479	103.9353	115.2618	127.8259	140.2049	149.6965 (72)
Total internal gains	731.8736	728.4873	703.1978	654.3100	605.0934	566.7395	544.8758	550.2617	580.1991	624.3000	672.6914	713.0214 (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					5.2000	12.7650	0.7200	0.7000				0.7700	23.1841 (74)	
South					1.3000	54.2217	0.7200	0.7000				0.7700	24.6196 (78)	
West					8.1000	23.8018	0.7200	0.7000				0.7700	67.3377 (80)	
South					0.8000	52.3616	0.6300	0.7000				1.0000	16.6258 (82)	

Solar gains	131.7671	215.7972	338.6280	492.8111	589.6601	641.1835	603.1855	528.7442	415.6031	269.9145	159.6882	110.5391	(83)	
Total gains	863.6407	944.2845	1041.8258	1147.1210	1194.7535	1207.9230	1148.0613	1079.0059	995.8022	894.2145	832.3795	823.5604	(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	30.5697	30.7184	30.7184	30.9308	30.8615	31.1928	31.1928	31.2544	31.1928	30.9308	30.9986	30.7907
alpha	3.0380	3.0479	3.0479	3.0621	3.0574	3.0795	3.0795	3.0836	3.0795	3.0621	3.0666	3.0527
util living area	0.9616	0.9475	0.9140	0.8410	0.7164	0.5224	0.3689	0.4002	0.6648	0.8671	0.9424	0.9658 (86)
Living	19.0259	19.2553	19.6840	20.2202	20.6555	20.9118	20.9787	20.9726	20.7989	20.2570	19.5730	18.9916
Non living	17.6912	17.9825	18.5178	19.1744	19.6711	19.9312	19.9792	19.9783	19.8366	19.2330	18.3924	17.6524
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	19.9901	19.2553	19.6840	20.2202	20.6555	20.9118	20.9787	20.9726	20.7989	20.2570	19.5730	19.2725 (87)
Th 2	19.9679	19.9724	19.9724	19.9787	19.9766	19.9864	19.9864	19.9882	19.9864	19.9787	19.9807	19.9745 (88)
util rest of house	0.9548	0.9382	0.8982	0.8109	0.6610	0.4360	0.2609	0.2882	0.5862	0.8349	0.9303	0.9596 (89)
MIT 2	19.0603	17.9825	18.5178	19.1744	19.6711	19.9312	19.9792	19.9783	19.8366	19.2330	18.3924	18.0708 (90)
Living area fraction	19.4603	18.5301	19.0196	19.6244	20.0947	20.3531	20.4092	20.4061	20.2506	19.6736	18.9003	18.5879 (92)
MIT	19.4603	18.5301	19.0196	19.6244	20.0947	20.3531	20.4092	20.4061	20.2506	19.6736	18.9003	18.5879 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4603	18.5301	19.0196	19.6244	20.0947	20.3531	20.4092	20.4061	20.2506	19.6736	18.9003	18.5879 (93)

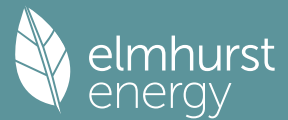
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9509	0.9213	0.8802	0.7989	0.6680	0.4685	0.3069	0.3357	0.6082	0.8236	0.9139	0.9488 (94)
Useful gains	821.1944	869.9327	916.9888	916.4586	798.0364	565.8884	352.3372	362.2065	605.6708	736.4992	760.6922	781.3777 (95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000 (96)
Heat loss rate W	1943.2817	1727.7977	1564.7750	1300.5655	964.3947	603.8298	359.2970	371.4107	696.3357	1093.1598	1454.6539	1812.1117 (97)
Space heating kWh	834.8330	576.4853	481.9529	276.5570	123.7706	0.0000	0.0000	0.0000	0.0000	265.3554	499.6524	766.8661 (98a)
Space heating requirement - total per year (kWh/year)												3825.4727
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	834.8330	576.4853	481.9529	276.5570	123.7706	0.0000	0.0000	0.0000	0.0000	265.3554	499.6524	766.8661 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3825.4727
Space heating per m ²										(98c) / (4) =		32.2417 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												305.5306 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	834.8330	576.4853	481.9529	276.5570	123.7706	0.0000	0.0000	0.0000	0.0000	265.3554	499.6524	766.8661 (98)
Space heating efficiency (main heating system 1)	305.5306	305.5306	305.5306	305.5306	305.5306	0.0000	0.0000	0.0000	0.0000	305.5306	305.5306	305.5306 (210)
Space heating fuel (main heating system)	273.2404	188.6833	157.7429	90.5169	40.5100	0.0000	0.0000	0.0000	0.0000	86.8507	163.5360	250.9949 (211)
Space heating efficiency (main heating system 2)												

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
	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	275.9062	224.9603	194.5609	131.9868	95.5553	75.3548	73.5805	92.1426	129.2155	187.9835	238.6694	(64)
Efficiency of water heater (217)m	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	186.1602	(216)
Fuel for water heating, kWh/month	148.2090	120.8423	104.5126	70.8996	51.3296	40.4785	39.5253	49.4964	69.4109	100.9794	128.2065	(217)
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	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	(231)
Lighting	39.8340	31.9563	28.7731	21.0804	16.2831	13.3034	14.8540	19.3078	25.0789	32.9049	37.1660	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-45.5265	-60.4255	-90.4159	-104.8671	-109.8672	-101.5337	-99.6204	-95.1546	-84.7091	-73.1823	-49.9742	(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	(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	(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	(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	(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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											1252.0750	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											186.1602	
Water heating fuel used											1070.8269	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans: pump for solar water heating											80.0000	(230g)
Total electricity for the above, kWh/year											80.0000	(231)
Electricity for lighting (calculated in Appendix L)											321.4831	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-954.2425	(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											1770.1425	(238)

10a. Fuel costs - using BEDF prices (570)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1252.0750	26.0600	326.2908	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1070.8269	26.0600	279.0575	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	26.0600	20.8480	(249)
Energy for lighting	321.4831	26.0600	83.7785	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-954.2425	26.0600	-248.6756	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-248.6756	(252)
Total energy cost			461.2991	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1252.0750	0.1554	194.5712	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1070.8269	0.1463	156.6969	(264)
Space and water heating			351.2681	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	321.4831	0.1443	46.3999	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-954.2425	0.1347	-128.5051	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-128.5051	(269)
Total CO2, kg/year			280.2600	(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	1252.0750	1.5753	1972.3820	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1070.8269	1.5413	1650.4922	(278)
Space and water heating			3622.8742	(279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240	(281)
Energy for lighting	321.4831	1.5338	493.1015	(282)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-954.2425	1.4977	-1429.1818
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1429.1818 (283)
Total Primary energy kWh/year			2807.8179 (286)