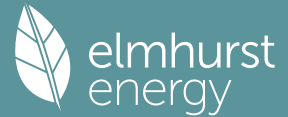


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Property Reference	P22691(6) Mount P				Issued on Date	13/06/2025
Assessment Reference	As Built	Prop Type Ref				
Property	48, Pleasant Place, Reading, RG1 2TD					
SAP Rating	91 B	DER	12.10	TER	12.27	
Environmental	89 B	% DER < TER				1.39
CO ₂ Emissions (t/year)	1.13	DFEE	39.66	TFEE	42.89	
Compliance Check	See BREL	% DFEE < TFEE				7.53
% DPER < TPER	0.89	DPER	63.75	TPER	64.33	
Assessor Details	Mr. Malcolm Lisle				Assessor ID	P736-0001
Client	JZ, Jay Zaman					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	38.0700 (1b)	x 2.5000 (2b)	= 95.1750 (1b) - (3b)
First floor	39.8900 (1c)	x 2.8000 (2c)	= 111.6920 (1c) - (3c)
Second floor	29.6400 (1d)	x 2.9000 (2d)	= 85.9560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	292.8230 (5)

2. Ventilation rate

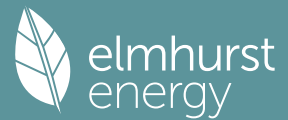
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1025 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.2900	(17)
Infiltration rate	0.2670	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2469 (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	0.3148	0.3087	0.3025	0.2716	0.2654	0.2346	0.2346	0.2284	0.2469	0.2654	0.2778	0.2901 (22b)
Effective ac	0.5496	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421 (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/Doors			24.0300	1.4151	34.0047		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			38.0700	0.1300	4.9491	110.0000	4187.7000 (28a)
External Wall	145.6000	24.0300	121.5700	0.1300	15.8041	9.0000	1094.1300 (29a)
External Roof - Sloping	33.4700	4.0600	29.4100	0.1800	5.2938	9.0000	264.6900 (30)
External Roof - Flat Roof	14.2500		14.2500	0.1200	1.7100	9.0000	128.2500 (30)
Total net area of external elements Aum(A, m ²)			231.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2243		(33)
Main dwelling							
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000 (32)
Internal Walls - Timber			111.2600			9.0000	1001.3400 (32c)
Internal Floor - 1st Floor			39.8900			18.0000	718.0200 (32d)
Internal Floor - 2nd Floor			25.6400			18.0000	461.5200 (32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400 (32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12069.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							112.1741 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	17.0000	0.0440	0.7480
E3 Sill	11.6000	0.0640	0.7424
E4 Jamb	46.6000	0.0480	2.2368
E5 Ground floor (normal)	19.8000	0.0510	1.0098
E6 Intermediate floor within a dwelling	36.4000	0.0130	0.4732
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592
E13 Gable (insulation at rafter level)	9.6000	0.0620	0.5952
E15 Flat roof with parapet	7.0000	0.0300	0.2100
E16 Corner (normal)	12.1000	0.0300	0.3630
E18 Party wall between dwellings	2.5000	0.0870	0.2175
E25 Staggered party wall between dwellings	14.6000	0.2400	3.5040
P1 Party wall - Ground floor	7.6000	0.0320	0.2432
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.4800	1.5840
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040
R1 Head of roof window	3.1000	0.0240	0.0744
R2 Sill of roof window	3.1000	0.0240	0.0744
R3 Jamb of roof window	4.8000	0.0240	0.1152
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0040	-0.0100
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.8019 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	83.0262 (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	53.1049	52.9190	52.7367	51.8805	51.7203	50.9746	50.9746	50.8365	51.2618	51.7203	52.0444	52.3831
Heat transfer coeff	136.1311	135.9451	135.7628	134.9066	134.7465	134.0007	134.0007	133.8626	134.2880	134.7465	135.0705	135.4093
Average = Sum(39)m / 12 =												134.9059

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2652	1.2634	1.2617	1.2538	1.2523	1.2454	1.2454	1.2441	1.2480	1.2523	1.2553	1.2585
HLP (average)												1.2538
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7996 (42)
Hot water usage for mixer showers	71.1603	70.0909	68.5326	65.5510	63.3507	60.8969	59.5022	61.0487	62.7440	65.3786	68.4242	70.8877	(42a)
Hot water usage for baths	30.7245	30.2682	29.6256	28.4408	27.5537	26.5700	26.0386	26.6767	27.3715	28.4241	29.6332	30.6206	(42b)
Hot water usage for other uses	43.3010	41.7264	40.1518	38.5772	37.0026	35.4281	35.4281	37.0026	38.5772	40.1518	41.7264	43.3010	(42c)
Average daily hot water use (litres/day)													133.4584 (43)
Daily hot water use	145.1858	142.0855	138.3100	132.5691	127.9070	122.8950	120.9689	124.7281	128.6927	133.9545	139.7839	144.8093	(44)
Energy conte	229.9388	202.3279	212.5774	181.4805	172.1875	151.1137	146.3014	154.4394	158.6909	181.7750	199.1477	226.7363	(45)
Energy content (annual)										Total = Sum(45)m =			2216.7165
Distribution loss (46)m = 0.15 x (45)m	34.4908	30.3492	31.8866	27.2221	25.8281	22.6671	21.9452	23.1659	23.8036	27.2662	29.8722	34.0105	(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													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	44.1587	39.8714	44.1136	42.6275	44.0086	42.5486	43.9413	43.9624	42.5683	44.0335	42.6735	44.1504	(61)
Total heat required for water heating calculated for each month	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(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	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			2735.3743 (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)
													0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month	87.4943	77.2419	81.7104	70.9991	68.2545	60.8825	59.6305	62.3417	63.4068	71.4486	76.8850	86.4274	(65)

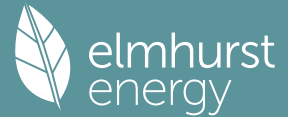
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.2063	149.6927	135.2063	139.7132	135.2063	139.7132	135.2063	135.2063	139.7132	135.2063	139.7132	135.2063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.0617	270.8433	263.8337	248.9110	230.0737	212.3694	200.5418	197.7602	204.7698	219.6925	238.5297	256.2341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	(69)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	(71)
Water heating gains (Table 5)	117.5999	114.9432	109.8258	98.6099	91.7399	84.5590	80.1486	83.7926	88.0650	96.0330	106.7847	116.1659	(72)
Total internal gains	588.8623	603.4737	576.8602	555.2285	525.0143	501.6360	480.8911	481.7535	497.5424	518.9262	553.0221	575.6007	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	9.6400	10.6334	0.6300	0.0000	0.7700	49.7256 (74)
Southeast	8.5400	36.7938	0.6300	0.0000	0.7700	152.4278 (77)
South	5.8500	46.7521	0.6300	0.0000	0.7700	132.6746 (78)
East	4.0600	26.2379	0.6300	0.7000	1.0000	42.2802 (82)

Solar gains	377.1083	656.8245	938.7700	1233.0308	1446.7914	1465.7434	1400.8540	1236.5395	1039.7327	736.5776	454.2841	321.0682 (83)
Total gains	965.9706	1260.2982	1515.6302	1788.2593	1971.8057	1967.3794	1881.7450	1718.2930	1537.2751	1255.5039	1007.3062	896.6690 (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	24.6289	24.6626	24.6957	24.8524	24.8820	25.0204	25.0204	25.0463	24.9669	24.8820	24.8223	24.7602
alpha	2.6419	2.6442	2.6464	2.6568	2.6588	2.6680	2.6680	2.6698	2.6645	2.6588	2.6548	2.6507
util living area	0.9373	0.8862	0.8126	0.6926	0.5498	0.4077	0.3035	0.3432	0.5291	0.7653	0.9011	0.9469 (86)
MIT	18.6709	19.1742	19.7439	20.3272	20.7110	20.9051	20.9682	20.9552	20.8062	20.2470	19.3438	18.5673 (87)
Th 2	19.8682	19.8696	19.8709	19.8772	19.8784	19.8839	19.8839	19.8849	19.8818	19.8784	19.8760	19.8735 (88)
util rest of house	0.9276	0.8701	0.7876	0.6550	0.4993	0.3445	0.2301	0.2654	0.4610	0.7252	0.8841	0.9385 (89)
MIT 2	17.1957	17.8182	18.5114	19.1986	19.6207	19.8171	19.8685	19.8617	19.7328	19.1331	18.0459	17.0695 (90)
Living area fraction	17.6715	18.2556	18.9090	19.5627	19.9724	20.1681	20.2232	20.2145	20.0791	19.4924	18.4646	17.5526 (91)
MIT	17.6715	18.2556	18.9090	19.5627	19.9724	20.1681	20.2232	20.2145	20.0791	19.4924	18.4646	17.5526 (92)
Temperature adjustment												0.0000
adjusted MIT	17.6715	18.2556	18.9090	19.5627	19.9724	20.1681	20.2232	20.2145	20.0791	19.4924	18.4646	17.5526 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9023	0.8417	0.7629	0.6436	0.5037	0.3610	0.2528	0.2889	0.4736	0.7095	0.8570	0.9149 (94)
Useful gains	871.5717	1060.7310	1156.3104	1150.9438	993.2757	710.2439	475.7437	496.3880	728.0301	890.7883	863.2373	820.3375 (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	1820.2834	1815.6349	1684.6774	1438.4655	1114.6822	746.1245	485.5130	510.6133	802.9169	1198.2174	1535.0207	1808.0722 (97)
Space heating kWh	705.8415	507.2954	393.1050	207.0156	90.3264	0.0000	0.0000	0.0000	0.0000	228.7272	483.6840	734.8746 (98a)
Space heating requirement - total per year (kWh/year)												3350.8698
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	705.8415	507.2954	393.1050	207.0156	90.3264	0.0000	0.0000	0.0000	0.0000	228.7272	483.6840	734.8746 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3350.8698
Space heating per m2										(98c) / (4) =		31.1419 (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 %)												89.0000 (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	705.8415	507.2954	393.1050	207.0156	90.3264	0.0000	0.0000	0.0000	0.0000	228.7272	483.6840	734.8746 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	793.0803	569.9948	441.6911	232.6018	101.4904	0.0000	0.0000	0.0000	0.0000	256.9969	543.4652	825.7018 (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	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868 (64)
Efficiency of water heater (217)m	88.5179	88.4434	88.3206	88.1081	87.7942	87.3000	87.3000	87.3000	87.3000	88.1473	88.4261	87.3000 (216)
Fuel for water heating, kWh/month	309.6522	273.8465	290.6355	254.3557	246.2533	221.8354	217.9183	227.2644	230.5375	256.1719	273.4728	305.9635 (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	26.8508	21.5407	19.3950	14.2096	10.9759	8.9674	10.0126	13.0148	16.9049	22.1801	25.0524	27.5971 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.4441	-37.5844	-61.9195	-77.7931	-89.3648	-85.2244	-83.6568	-75.8220	-62.4884	-45.9294	-27.0133	-19.5845 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-8.2292	-20.2529	-48.7237	-86.2986	-125.7570	-131.0323	-127.7553	-100.8705	-64.6188	-31.4136	-11.5652	-6.2250 (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												3765.0223 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	3107.9069	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.7015	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1452.5668	(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	5723.0639	(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	3765.0223	0.2100	790.6547 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3107.9069	0.2100	652.6604 (264)
Space and water heating			1443.3151 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.7015	0.1443	31.2767 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-689.8248	0.1325	-91.3753
PV Unit electricity exported	-762.7420	0.1220	-93.0618
Total			-184.4371 (269)
Total CO2, kg/year			1302.0840 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.1000 (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	3765.0223	1.1300	4254.4752 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3107.9069	1.1300	3511.9347 (278)
Space and water heating			7766.4099 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	216.7015	1.5338	332.3840 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-689.8248	1.4894	-1027.4528
PV Unit electricity exported	-762.7420	0.4477	-341.4538
Total			-1368.9066 (283)
Total Primary energy kWh/year			6859.9881 (286)
Dwelling Primary energy Rate (DPER)			63.7500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	38.0700 (1b)	x 2.5000 (2b)	= 95.1750 (1b) - (3b)
First floor	39.8900 (1c)	x 2.8000 (2c)	= 111.6920 (1c) - (3c)
Second floor	29.6400 (1d)	x 2.9000 (2d)	= 85.9560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	292.8230 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1366 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)

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Infiltration rate	0.3866 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = $1 - [0.075 \times (19)] = 0.9250$ (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3576 (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	0.4559	0.4470	0.4381	0.3934	0.3844	0.3397	0.3397	0.3308	0.3576	0.3844	0.4023	0.4202	(22b)
Effective ac	0.6039	0.5999	0.5960	0.5774	0.5739	0.5577	0.5577	0.5547	0.5639	0.5739	0.5809	0.5883	(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 Opening Type			23.0200	1.1450	26.3588			(27)
TER Roof Window			3.8900	1.1450	5.8496			(27a)
Ground Floor			38.0700	0.1300	4.9491			(28a)
External Wall	145.6000	23.0200	122.5800	0.1800	22.0644			(29a)
External Roof - Sloping	33.4700	3.8900	29.5800	0.1100	3.2538			(30)
External Roof - Flat Roof	14.2500		14.2500	0.1100	1.5675			(30)
Total net area of external elements Aum(A, m2)			231.3900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	64.0432			(33)
Main dwelling								
Party Wall 1			54.1200	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							112.1741	(35)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	17.0000	0.0500	0.8500
E3 Sill	11.6000	0.0500	0.5800
E4 Jamb	46.6000	0.0500	2.3300
E5 Ground floor (normal)	19.8000	0.1600	3.1680
E6 Intermediate floor within a dwelling	36.4000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	4.8000	0.0400	0.1920
E13 Gable (insulation at rafter level)	9.6000	0.0800	0.7680
E15 Flat roof with parapet	7.0000	0.5600	3.9200
E16 Corner (normal)	12.1000	0.0900	1.0890
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	14.6000	0.0600	0.8760
P1 Party wall - Ground floor	7.6000	0.0800	0.6080
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.1200	0.3960
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.0800	0.3840
R1 Head of roof window	3.1000	0.0800	0.2480
R2 Sill of roof window	3.1000	0.0600	0.1860
R3 Jamb of roof window	4.8000	0.0800	0.3840
R4 Ridge (vaulted ceiling)	4.8000	0.0800	0.3840
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250

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

Point Thermal bridges

Total fabric heat loss

(33) + (36) + (36a) = 80.3312 (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	
	58.3601	57.9701	57.5878	55.7921	55.4561	53.8921	53.8921	53.6025	54.4945	55.4561	56.1357	56.8463	(38)
Heat transfer coeff	138.6913	138.3013	137.9190	136.1233	135.7873	134.2233	134.2233	133.9337	134.8257	135.7873	136.4670	137.1775	(39)
Average = Sum(39)m / 12 =												136.1217	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.2890	1.2853	1.2818	1.2651	1.2620	1.2474	1.2474	1.2447	1.2530	1.2620	1.2683	1.2749	(40)
HLP (average)												1.2651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7996 (42)
Hot water usage for mixer showers													
	71.1603	70.0909	68.5326	65.5510	63.3507	60.8969	59.5022	61.0487	62.7440	65.3786	68.4242	70.8877	(42a)
Hot water usage for baths													
	30.7245	30.2682	29.6256	28.4408	27.5537	26.5700	26.0386	26.6767	27.3715	28.4241	29.6332	30.6206	(42b)
Hot water usage for other uses													
	43.3010	41.7264	40.1518	38.5772	37.0026	35.4281	35.4281	37.0026	38.5772	40.1518	41.7264	43.3010	(42c)
Average daily hot water use (litres/day)													133.4584 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	145.1858	142.0855	138.3100	132.5691	127.9070	122.8950	120.9689	124.7281	128.6927	133.9545	139.7839	144.8093	(44)
Energy conte	229.9388	202.3279	212.5774	181.4805	172.1875	151.1137	146.3014	154.4394	158.6909	181.7750	199.1477	226.7363	(45)
Energy content (annual)										Total = Sum(45)m =			2216.7165
Distribution loss (46)m = 0.15 x (45)m													
	34.4908	30.3492	31.8866	27.2221	25.8281	22.6671	21.9452	23.1659	23.8036	27.2662	29.8722	34.0105	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	280.8977	248.3553	263.5363	230.7955	223.1464	200.4288	197.2603	205.3983	208.0060	232.7339	248.4628	277.6953	(62)
WWHRS	-32.5315	-28.7712	-30.1275	-24.9468	-23.2495	-19.8947	-18.6482	-19.8304	-20.5839	-24.2661	-27.4906	-31.9291	(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	248.3662	219.5841	233.4088	205.8488	199.8969	180.5340	178.6121	185.5679	187.4221	208.4678	220.9723	245.7662	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			2514.4471 (64)
Electric shower(s)													2514 (64)

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	89.1944	78.7809	83.4217	72.6710	69.9921	62.5741	61.3849	64.0908	65.0935	73.1799	78.5454	88.1296 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	135.2063	149.6927	135.2063	139.7132	135.2063	139.7132	135.2063	135.2063	139.7132	135.2063	139.7132	135.2063 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	268.0617	270.8433	263.8337	248.9110	230.0737	212.3694	200.5418	197.7602	204.7698	219.6925	238.5297	256.2341 (68)
Pumps, fans	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851 (71)
Total internal gains	119.8849	117.2334	112.1259	100.9320	94.0753	86.9084	82.5066	86.1436	90.4076	98.3601	109.0908	118.4537 (72)
	591.1473	605.7639	579.1604	557.5506	527.3498	503.9854	483.2492	484.1045	499.8851	521.2533	555.3282	577.8885 (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	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273 (74)						
Southeast	8.1800	36.7938	0.6300	0.7000	0.7700	91.9814 (77)						
South	5.6000	46.7521	0.6300	0.7000	0.7700	80.0130 (78)						
East	3.8900	26.2379	0.6300	0.7000	1.0000	40.5098 (82)						
Solar gains	242.5315	426.4177	617.9804	822.3208	971.8178	986.8667	942.2757	827.5323	688.3250	480.6699	292.9373	205.9671 (83)
Total gains	833.6789	1032.1815	1197.1407	1379.8713	1499.1676	1490.8521	1425.5249	1311.6368	1188.2101	1001.9233	848.2655	783.8556 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	24.1743	24.2424	24.3096	24.6303	24.6913	24.9790	24.9790	25.0330	24.8673	24.6913	24.5683	24.4410	
util living area	2.6116	2.6162	2.6206	2.6420	2.6461	2.6653	2.6653	2.6689	2.6578	2.6461	2.6379	2.6294	
	0.9545	0.9235	0.8761	0.7861	0.6610	0.5114	0.3902	0.4344	0.6330	0.8359	0.9301	0.9605 (86)	
MIT	18.4304	18.8454	19.3891	20.0425	20.5366	20.8347	20.9411	20.9205	20.6955	20.0206	19.1155	18.3661 (87)	
Th 2	19.8495	19.8523	19.8551	19.8683	19.8707	19.8822	19.8822	19.8844	19.8778	19.8707	19.8658	19.8606 (88)	
util rest of house	0.9470	0.9115	0.8567	0.7534	0.6099	0.4387	0.2996	0.3409	0.5621	0.8025	0.9171	0.9540 (89)	
MIT 2	16.8848	17.4053	18.0809	18.8775	19.4440	19.7617	19.8526	19.8415	19.6343	18.8762	17.7614	16.8101 (90)	
Living area fraction	17.3834	17.8699	18.5029	19.2533	19.7964	20.1078	20.2037	20.1896	19.9766	19.2454	18.1982	17.3121 (92)	
MIT	17.3834	17.8699	18.5029	19.2533	19.7964	20.1078	20.2037	20.1896	19.9766	19.2454	18.1982	17.3121 (93)	
Temperature adjustment												0.0000	
adjusted MIT	17.3834	17.8699	18.5029	19.2533	19.7964	20.1078	20.2037	20.1896	19.9766	19.2454	18.1982	17.3121 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9245	0.8843	0.8286	0.7330	0.6062	0.4541	0.3265	0.3675	0.5689	0.7804	0.8915	0.9332 (94)	
Ext temp.	770.7702	912.7636	991.9439	1011.5061	908.8654	677.0488	465.4303	482.0797	675.9830	781.9329	756.2157	731.4892 (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	1814.5539	1793.7497	1655.4275	1409.3287	1099.3920	739.2754	483.7055	507.5508	792.3170	1173.9319	1514.5368	1798.6794 (97)	
Space heating requirement - total per year (kWh/year)	776.5751	592.0226	493.6318	286.4323	141.7518	0.0000	0.0000	0.0000	0.0000	291.6472	545.9912	793.9895 (98a)	
Solar heating kWh												3922.0414	
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	776.5751	592.0226	493.6318	286.4323	141.7518	0.0000	0.0000	0.0000	0.0000	291.6472	545.9912	793.9895 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3922.0414	
Space heating per m2												36.4502 (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 %)													92.4000 (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	
	776.5751	592.0226	493.6318	286.4323	141.7518	0.0000	0.0000	0.0000	0.0000	291.6472	545.9912	793.9895 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	840.4492	640.7171	534.2336	309.9916	153.4110	0.0000	0.0000	0.0000	0.0000	315.6355	590.8995	859.2960 (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)	

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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	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	248.3662	219.5841	233.4088	205.8488	199.8969	180.5340	178.6121	185.5679	187.4221	208.4678	220.9723	245.7662 (64)
Efficiency of water heater (217)m	86.6512	86.3966	85.9450	85.0894	83.6578	80.3000	80.3000	80.3000	80.3000	85.1009	86.2390	80.3000 (216)
Fuel for water heating, kWh/month	286.6275	254.1584	271.5793	241.9206	238.9460	224.8244	222.4310	231.0932	233.4024	244.9655	256.2325	86.7051 (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	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Lighting	28.0932	22.5374	20.2924	14.8671	11.4838	9.3824	10.4759	13.6170	17.6871	23.2064	26.2116	28.8740 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.3321	-53.5458	-78.2798	-89.5445	-97.8275	-91.7229	-90.5424	-84.8235	-74.9847	-61.8646	-41.3467	-32.1656 (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	-18.4099	-39.0041	-78.0505	-118.0142	-156.8358	-157.9148	-156.1089	-131.8626	-96.2003	-56.1020	-24.6803	-14.5417 (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												4244.6335 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2989.6316 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												226.7283 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1881.7051 (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												5665.2883 (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	4244.6335	0.2100	891.3730 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2989.6316	0.2100	627.8226 (264)
Space and water heating			1519.1957 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	226.7283	0.1443	32.7239 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-833.9799	0.1342	-111.9526
PV Unit electricity exported	-1047.7252	0.1257	-131.6900
Total			-243.6426 (269)
Total CO2, kg/year			1320.2063 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2700 (273)

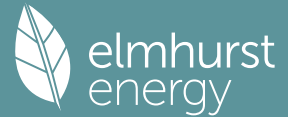
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4244.6335	1.1300	4796.4359 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2989.6316	1.1300	3378.2837 (278)
Space and water heating			8174.7196 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	226.7283	1.5338	347.7634 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-833.9799	1.4961	-1247.7216
PV Unit electricity exported	-1047.7252	0.4614	-483.3820
Total			-1731.1036 (283)
Total Primary energy kWh/year			6921.4802 (286)
Target Primary Energy Rate (TPER)			64.3300 (287)

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

1. Overall dwelling characteristics

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	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	38.0700 (1b)	x 2.5000 (2b)	= 95.1750 (1b) - (3b)
First floor	39.8900 (1c)	x 2.8000 (2c)	= 111.6920 (1c) - (3c)
Second floor	29.6400 (1d)	x 2.9000 (2d)	= 85.9560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 292.8230 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1366 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.2900 (17)
Infiltration rate	0.3011 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2785 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3551	0.3481	0.3412	0.3064	0.2994	0.2646	0.2646	0.2576	0.2785	0.2994	0.3133	0.3273	(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	0.5631	0.5606	0.5582	0.5469	0.5448	0.5350	0.5350	0.5332	0.5388	0.5448	0.5491	0.5535	(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/Doors			24.0300	1.4151	34.0047		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			38.0700	0.1300	4.9491	110.0000	4187.7000 (28a)
External Wall	145.6000	24.0300	121.5700	0.1300	15.8041	9.0000	1094.1300 (29a)
External Roof - Sloping	33.4700	4.0600	29.4100	0.1800	5.2938	9.0000	264.6900 (30)
External Roof - Flat Roof	14.2500		14.2500	0.1200	1.7100	9.0000	128.2500 (30)
Total net area of external elements Aum(A, m ²)			231.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2243		(33)
Main dwelling							
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000 (32)
Internal Walls - Timber			111.2600			9.0000	1001.3400 (32c)
Internal Floor - 1st Floor			39.8900			18.0000	718.0200 (32d)
Internal Floor - 2nd Floor			25.6400			18.0000	461.5200 (32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400 (32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12069.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		112.1741 (35)

List of Thermal Bridges

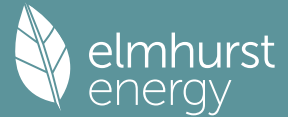
K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	17.0000	0.0440	0.7480
E3 Sill	11.6000	0.0640	0.7424
E4 Jamb	46.6000	0.0480	2.2368
E5 Ground floor (normal)	19.8000	0.0510	1.0098
E6 Intermediate floor within a dwelling	36.4000	0.0130	0.4732
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592
E13 Gable (insulation at rafter level)	9.6000	0.0620	0.5952
E15 Flat roof with parapet	7.0000	0.0300	0.2100
E16 Corner (normal)	12.1000	0.0300	0.3630
E18 Party wall between dwellings	2.5000	0.0870	0.2175
E25 Staggered party wall between dwellings	14.6000	0.2400	3.5040
P1 Party wall - Ground floor	7.6000	0.0320	0.2432
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.4800	1.5840
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040
R1 Head of roof window	3.1000	0.0240	0.0744
R2 Sill of roof window	3.1000	0.0240	0.0744
R3 Jamb of roof window	4.8000	0.0240	0.1152
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0040	-0.0100

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.8019 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	83.0262 (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	54.4086	54.1720	53.9401	52.8509	52.6471	51.6984	51.6984	51.5227	52.0638	52.6471	53.0593	53.4904	(38)
Average = Sum(39)m / 12 =	137.4348	137.1982	136.9663	135.8770	135.6732	134.7245	134.7245	134.5488	135.0899	135.6732	136.0855	136.5165	(39)
												135.8760	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2773	1.2751	1.2729	1.2628	1.2609	1.2521	1.2521	1.2505	1.2555	1.2609	1.2647	1.2687	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7996 (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	30.7245	30.2682	29.6256	28.4408	27.5537	26.5700	26.0386	26.6767	27.3715	28.4241	29.6332	30.6206 (42b)
Hot water usage for other uses	43.3010	41.7264	40.1518	38.5772	37.0026	35.4281	35.4281	37.0026	38.5772	40.1518	41.7264	43.3010 (42c)
Average daily hot water use (litres/day)												67.8510 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	74.0255	71.9946	69.7774	67.0181	64.5563	61.9981	61.4667	63.6794	65.9487	68.5759	71.3596	73.9216 (44)
Energy content (annual)	117.2382	102.5193	107.2453	91.7444	86.9052	76.2338	74.3386	78.8483	81.3213	93.0568	101.6649	115.7434 (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	99.6525	87.1414	91.1585	77.9827	73.8695	64.7988	63.1879	67.0211	69.1231	79.0983	86.4151	98.3819 (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	99.6525	87.1414	91.1585	77.9827	73.8695	64.7988	63.1879	67.0211	69.1231	79.0983	86.4151	98.3819 (64)
12Total per year (kWh/year)												957.8307 (64)
Electric shower(s)	56.9876	50.7764	55.4459	52.9113	53.9042	51.4194	53.1333	53.9042	52.9113	55.4459	54.4033	56.9876 (64a)
												958 (64)
												648.2302 (64a)
Heat gains from water heating, kWh/month	39.1600	34.4795	36.6511	32.7235	31.9434	29.0545	29.0803	30.2313	30.5086	33.6360	35.2046	38.8424 (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	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.2063	149.6927	135.2063	139.7132	135.2063	139.7132	135.2063	135.2063	139.7132	135.2063	139.7132	135.2063 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.0617	270.8433	263.8337	248.9110	230.0737	212.3694	200.5418	197.7602	204.7698	219.6925	238.5297	256.2341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981 (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)	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851 (71)
Water heating gains (Table 5)	52.6344	51.3087	49.2622	45.4493	42.9347	40.3535	39.0864	40.6335	42.3731	45.2097	48.8953	52.2075 (72)
Total internal gains	520.8969	536.8392	513.2966	499.0679	473.2092	457.4305	439.8289	438.5944	451.8505	465.1030	492.1326	508.6423 (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					9.6400	10.6334	0.6300	0.0000	0.7700				49.7256 (74)
Southeast					8.5400	36.7938	0.6300	0.0000	0.7700				152.4278 (77)
South					5.8500	46.7521	0.6300	0.0000	0.7700				132.6746 (78)
East					4.0600	26.2379	0.6300	0.7000	1.0000				42.2802 (82)
Solar gains	377.1083	656.8245	938.7700	1233.0308	1446.7914	1465.7434	1400.8540	1236.5395	1039.7327	736.5776	454.2841	321.0682	(83)
Total gains	898.0051	1193.6637	1452.0667	1732.0987	1920.0006	1923.1739	1840.6829	1675.1339	1491.5831	1201.6806	946.4167	829.7105	(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	24.3953	24.4373	24.4787	24.6749	24.7120	24.8860	24.8860	24.9185	24.8187	24.7120	24.6371	24.5594
alpha	2.6264	2.6292	2.6319	2.6450	2.6475	2.6591	2.6591	2.6612	2.6546	2.6475	2.6425	2.6373
util living area	0.9464	0.8979	0.8264	0.7065	0.5626	0.4174	0.3111	0.3526	0.5429	0.7812	0.9128	0.9552 (86)
MIT	18.5486	19.0700	19.6650	20.2837	20.6903	20.8983	20.9657	20.9516	20.7911	20.1950	19.2501	18.4474 (87)
Th 2	19.8587	19.8604	19.8621	19.8701	19.8716	19.8786	19.8786	19.8798	19.8759	19.8716	19.8686	19.8654 (88)
util rest of house	0.9379	0.8830	0.8024	0.6692	0.5115	0.3528	0.2358	0.2727	0.4738	0.7422	0.8974	0.9480 (89)
MIT 2	17.6604	18.1656	18.7325	19.3054	19.6559	19.8227	19.8656	19.8603	19.7503	19.2476	18.3559	17.5660 (90)
Living area fraction	17.9469	18.4574	19.0333	19.6210	19.9896	20.1697	20.2205	20.2123	20.0861	19.5532	18.6443	17.8503 (91)
MIT	17.9469	18.4574	19.0333	19.6210	19.9896	20.1697	20.2205	20.2123	20.0861	19.5532	18.6443	17.8503 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9469	18.4574	19.0333	19.6210	19.9896	20.1697	20.2205	20.2123	20.0861	19.5532	18.6443	17.8503 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9191	0.8605	0.7822	0.6603	0.5171	0.3701	0.2592	0.2970	0.4874	0.7297	0.8763	0.9307	(94)
Useful gains	825.3294	1027.1430	1135.8170	1143.6922	992.8699	711.6708	477.1914	497.4803	727.0561	876.9145	829.3271	772.1936	(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	1875.5575	1860.0444	1716.6409	1456.7312	1124.6727	750.3704	487.7649	512.9401	808.6589	1214.7126	1571.0183	1863.4931	(97)
Space heating kWh	781.3697	559.7097	432.1330	225.3881	98.0613	0.0000	0.0000	0.0000	0.0000	251.3218	534.0176	811.9268	(98a)
Space heating requirement - total per year (kWh/year)												3693.9282	
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	781.3697	559.7097	432.1330	225.3881	98.0613	0.0000	0.0000	0.0000	0.0000	251.3218	534.0176	811.9268	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3693.9282	
Space heating per m2										(98c) / (4) =		34.3302	(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	1266.4104	996.9614	1022.5711	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8819	0.9189	0.8978	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1116.8120	916.0822	918.1077	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2144.2382	2053.0088	1869.5887	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	739.7468	845.8734	707.9019	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	184.9367	211.4683	176.9755	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												573.3805	(107)
Energy for space heating												34.3302	(99)
Energy for space cooling												5.3288	(108)
Total												39.6590	(109)
Fabric Energy Efficiency (DFEE)												39.7	(109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	38.0700 (1b)	x 2.5000 (2b) =	95.1750 (1b) - (3b)
First floor	39.8900 (1c)	x 2.8000 (2c) =	111.6920 (1c) - (3c)
Second floor	29.6400 (1d)	x 2.9000 (2d) =	85.9560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	292.8230 (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) = 0.1366 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3866 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3576 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750 (22a)
Adj infilt rate	0.4559 0.4470 0.4381 0.3934 0.3844 0.3397 0.3397 0.3308 0.3576 0.3844 0.4023 0.4202 (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	0.6039 0.5999 0.5960 0.5774 0.5739 0.5577 0.5577 0.5547 0.5639 0.5739 0.5809 0.5883 (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 Opening Type			23.0200	1.1450	26.3588			(27)
TER Roof Window			3.8900	1.1450	5.8496			(27a)
Ground Floor			38.0700	0.1300	4.9491			(28a)
External Wall	145.6000	23.0200	122.5800	0.1800	22.0644			(29a)
External Roof - Sloping	33.4700	3.8900	29.5800	0.1100	3.2538			(30)
External Roof - Flat Roof	14.2500		14.2500	0.1100	1.5675			(30)
Total net area of external elements Aum (A, m2)			231.3900					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	64.0432		(33)
Main dwelling								
Party Wall 1			54.1200	0.0000	0.0000			(32)

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

112.1741 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	17.0000	0.0500	0.8500
E3 Sill	11.6000	0.0500	0.5800
E4 Jamb	46.6000	0.0500	2.3300
E5 Ground floor (normal)	19.8000	0.1600	3.1680
E6 Intermediate floor within a dwelling	36.4000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	4.8000	0.0400	0.1920
E13 Gable (insulation at rafter level)	9.6000	0.0800	0.7680
E15 Flat roof with parapet	7.0000	0.5600	3.9200
E16 Corner (normal)	12.1000	0.0900	1.0890
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	14.6000	0.0600	0.8760
P1 Party wall - Ground floor	7.6000	0.0800	0.6080
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.1200	0.3960
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.0800	0.3840
R1 Head of roof window	3.1000	0.0800	0.2480
R2 Sill of roof window	3.1000	0.0600	0.1860
R3 Jamb of roof window	4.8000	0.0800	0.3840
R4 Ridge (vaulted ceiling)	4.8000	0.0800	0.3840
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250

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

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 80.3312 (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	58.3601	57.9701	57.5878	55.7921	55.4561	53.8921	53.8921	53.6025	54.4945	55.4561	56.1357	56.8463	(38)
Heat transfer coeff	138.6913	138.3013	137.9190	136.1233	135.7873	134.2233	134.2233	133.9337	134.8257	135.7873	136.4670	137.1775	(39)
Average = Sum(39)m / 12 =													136.1217

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2890	1.2853	1.2818	1.2651	1.2620	1.2474	1.2474	1.2447	1.2530	1.2620	1.2683	1.2749	(40)
HLP (average)													1.2651
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

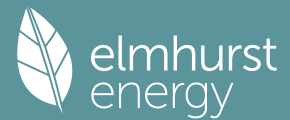
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7996 (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	0.0000	(42a)
Hot water usage for baths													
30.7245	30.2682	29.6256	28.4408	27.5537	26.5700	26.0386	26.6767	27.3715	28.4241	29.6332	30.6206		(42b)
Hot water usage for other uses													
43.3010	41.7264	40.1518	38.5772	37.0026	35.4281	35.4281	37.0026	38.5772	40.1518	41.7264	43.3010		(42c)
Average daily hot water use (litres/day)													67.8510 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.0255	71.9946	69.7774	67.0181	64.5563	61.9981	61.4667	63.6794	65.9487	68.5759	71.3596	73.9216	(44)
Energy conte	117.2382	102.5193	107.2453	91.7444	86.9052	76.2338	74.3386	78.8483	81.3213	93.0568	101.6649	115.7434	(45)
Energy content (annual)										Total = Sum(45)m =			1126.8597
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	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	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													
99.6525	87.1414	91.1585	77.9827	73.8695	64.7988	63.1879	67.0211	69.1231	79.0983	86.4151	98.3819		(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	99.6525	87.1414	91.1585	77.9827	73.8695	64.7988	63.1879	67.0211	69.1231	79.0983	86.4151	98.3819	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			957.8307 (64)
Electric shower(s)	56.9876	50.7764	55.4459	52.9113	53.9042	51.4194	53.1333	53.9042	52.9113	55.4459	54.4033	56.9876	(64a)
													648.2302 (64a)
Heat gains from water heating, kWh/month	39.1600	34.4795	36.6511	32.7235	31.9434	29.0545	29.0803	30.2313	30.5086	33.6360	35.2046	38.8424	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	139.9813	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
135.2063	149.6927	135.2063	139.7132	135.2063	139.7132	135.2063	135.2063	139.7132	135.2063	139.7132	135.2063		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

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Cooking gains	268.0617	270.8433	263.8337	248.9110	230.0737	212.3694	200.5418	197.7602	204.7698	219.6925	238.5297	256.2341 (68)
Pumps, fans	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981	36.9981 (69)
Losses e.g. evaporation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851 (71)
Total internal gains	52.6344	51.3087	49.2622	45.4493	42.9347	40.3535	39.0864	40.6335	42.3731	45.2097	48.8953	52.2075 (72)
	520.8969	536.8392	513.2966	499.0679	473.2092	457.4305	439.8289	438.5944	451.8505	465.1030	492.1326	508.6423 (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					9.2400	10.6334	0.6300	0.7000			0.7700	30.0273 (74)	
Southeast					8.1800	36.7938	0.6300	0.7000			0.7700	91.9814 (77)	
South					5.6000	46.7521	0.6300	0.7000			0.7700	80.0130 (78)	
East					3.8900	26.2379	0.6300	0.7000			1.0000	40.5098 (82)	

Solar gains	242.5315	426.4177	617.9804	822.3208	971.8178	986.8667	942.2757	827.5323	688.3250	480.6699	292.9373	205.9671 (83)	
Total gains	763.4284	963.2568	1131.2770	1321.3887	1445.0270	1444.2972	1382.1047	1266.1267	1140.1755	945.7729	785.0699	714.6094 (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	24.1743	24.2424	24.3096	24.6303	24.6913	24.9790	24.9790	25.0330	24.8673	24.6913	24.5683	24.4410
alpha	2.6116	2.6162	2.6206	2.6420	2.6461	2.6653	2.6653	2.6689	2.6578	2.6461	2.6379	2.6294
util living area	0.9624	0.9334	0.8882	0.7998	0.6752	0.5239	0.4008	0.4473	0.6493	0.8512	0.9404	0.9678 (86)
MIT	18.3273	18.7539	19.3146	19.9950	20.5107	20.8247	20.9372	20.9147	20.6753	19.9652	19.0293	18.2621 (87)
Th 2	19.8495	19.8523	19.8551	19.8683	19.8707	19.8822	19.8822	19.8844	19.8778	19.8707	19.8658	19.8606 (88)
util rest of house	0.9561	0.9227	0.8702	0.7681	0.6245	0.4504	0.3083	0.3519	0.5786	0.8198	0.9290	0.9624 (89)
MIT 2	17.4383	17.8574	18.4028	19.0543	19.5179	19.7821	19.8575	19.8483	19.6740	19.0467	18.1431	17.3814 (90)
Living area fraction	17.7251	18.1466	18.6969	19.3578	19.8382	20.1184	20.2058	20.1923	19.9970	19.3430	18.4290	17.6655 (92)
Temperature adjustment	17.7251	18.1466	18.6969	19.3578	19.8382	20.1184	20.2058	20.1923	19.9970	19.3430	18.4290	17.6655 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9401	0.9022	0.8481	0.7519	0.6229	0.4667	0.3360	0.3794	0.5868	0.8022	0.9100	0.9479 (94)
Ext temp.	717.7086	869.0640	959.4331	993.4924	900.1469	674.0756	464.3707	480.3771	669.0455	758.7445	714.3946	677.3513 (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	1861.9425	1832.0181	1682.1886	1423.5438	1105.0579	740.7009	483.9771	507.9123	795.0657	1187.1835	1546.0315	1847.1589 (97)
Space heating requirement - total per year (kWh/year)	851.3100	647.1051	537.7301	309.6370	152.4538	0.0000	0.0000	0.0000	0.0000	318.7587	598.7786	870.3368 (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)
Space heating contribution - total per year (kWh/year)	851.3100	647.1051	537.7301	309.6370	152.4538	0.0000	0.0000	0.0000	0.0000	318.7587	598.7786	870.3368 (98c)
Space heating requirement after solar 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 (99)
Space heating per m ²												

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	1261.6990	993.2524	1017.8959	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8043	0.8586	0.8295	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1014.8001	852.8554	844.3771	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1586.5518	1518.9397	1393.1497	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	411.6612	495.5668	408.2868	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	102.9153	123.8917	102.0717	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												328.8787 (107)
Energy for space heating												39.8337 (99)
Energy for space cooling												3.0565 (108)
Total												42.8902 (109)
Fabric Energy Efficiency (TFEE)												42.9 (109)

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1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Main dwelling						
Ground floor	38.0700 (1b)	x	2.5000 (2b)	=	95.1750 (1b)	- (3b)
First floor	39.8900 (1c)	x	2.8000 (2c)	=	111.6920 (1c)	- (3c)
Second floor	29.6400 (1d)	x	2.9000 (2d)	=	85.9560 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.6000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	292.8230 (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) = 0.1025 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.2900 (17)
Infiltration rate		0.2670 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2469 (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	0.3148	0.3087	0.3025	0.2716	0.2654	0.2346	0.2346	0.2284	0.2469	0.2654	0.2778	0.2901	(22b)
Effective ac	0.5496	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(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/Doors			24.0300	1.4151	34.0047			(27)
Rooflights			4.0600	1.5918	6.4625			(27a)
Ground Floor			38.0700	0.1300	4.9491	110.0000	4187.7000	(28a)
External Wall	145.6000	24.0300	121.5700	0.1300	15.8041	9.0000	1094.1300	(29a)
External Roof - Sloping	33.4700	4.0600	29.4100	0.1800	5.2938	9.0000	264.6900	(30)
External Roof - Flat Roof	14.2500		14.2500	0.1200	1.7100	9.0000	128.2500	(30)
Total net area of external elements Aum(A, m ²)			231.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2243			(33)
Main dwelling								
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000	(32)
Internal Walls - Timber			111.2600			9.0000	1001.3400	(32c)
Internal Floor - 1st Floor			39.8900			18.0000	718.0200	(32d)
Internal Floor - 2nd Floor			25.6400			18.0000	461.5200	(32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400	(32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12069.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		112.1741 (35)

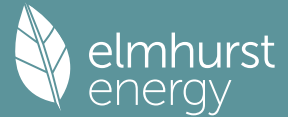
List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	17.0000	0.0440	0.7480	
E3 Sill	11.6000	0.0640	0.7424	
E4 Jamb	46.6000	0.0480	2.2368	
E5 Ground floor (normal)	19.8000	0.0510	1.0098	
E6 Intermediate floor within a dwelling	36.4000	0.0130	0.4732	
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592	
E13 Gable (insulation at rafter level)	9.6000	0.0620	0.5952	
E15 Flat roof with parapet	7.0000	0.0300	0.2100	
E16 Corner (normal)	12.1000	0.0300	0.3630	
E18 Party wall between dwellings	2.5000	0.0870	0.2175	
E25 Staggered party wall between dwellings	14.6000	0.2400	3.5040	
P1 Party wall - Ground floor	7.6000	0.0320	0.2432	
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.4800	1.5840	
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040	
R1 Head of roof window	3.1000	0.0240	0.0744	
R2 Sill of roof window	3.1000	0.0240	0.0744	
R3 Jamb of roof window	4.8000	0.0240	0.1152	
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0040	-0.0100	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.8019 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	83.0262 (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	53.1049	52.9190	52.7367	51.8805	51.7203	50.9746	50.9746	50.8365	51.2618	51.7203	52.0444	52.3831	(38)
Average = Sum(39)m / 12 =	136.1311	135.9451	135.7628	134.9066	134.7465	134.0007	134.0007	133.8626	134.2880	134.7465	135.0705	135.4093	(39)
	134.9059												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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HLP	1.2652	1.2634	1.2617	1.2538	1.2523	1.2454	1.2454	1.2441	1.2480	1.2523	1.2553	1.2585 (40)
HLP (average)												1.2538
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7996 (42)
Hot water usage for mixer showers												
71.1603	70.0909	68.5326	65.5510	63.3507	60.8969	59.5022	61.0487	62.7440	65.3786	68.4242	70.8877	(42a)
Hot water usage for baths												
30.7245	30.2682	29.6256	28.4408	27.5537	26.5700	26.0386	26.6767	27.3715	28.4241	29.6332	30.6206	(42b)
Hot water usage for other uses												
43.3010	41.7264	40.1518	38.5772	37.0026	35.4281	35.4281	37.0026	38.5772	40.1518	41.7264	43.3010	(42c)
Average daily hot water use (litres/day)												133.4584 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
145.1858	142.0855	138.3100	132.5691	127.9070	122.8950	120.9689	124.7281	128.6927	133.9545	139.7839	144.8093	(44)
Energy conte	229.9388	202.3279	212.5774	181.4805	172.1875	151.1137	146.3014	154.4394	158.6909	181.7750	199.1477	226.7363 (45)
Energy content (annual)												Total = Sum(45)m = 2216.7165
Distribution loss (46)m = 0.15 x (45)m												
34.4908	30.3492	31.8866	27.2221	25.8281	22.6671	21.9452	23.1659	23.8036	27.2662	29.8722	34.0105	(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	(59)
Combi loss	44.1587	39.8714	44.1136	42.6275	44.0086	42.5486	43.9413	43.9624	42.5683	44.0335	42.6735	(61)
Total heat required for water heating calculated for each month												
274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(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												
274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(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												
87.4943	77.2419	81.7104	70.9991	68.2545	60.8825	59.6305	62.3417	63.4068	71.4486	76.8850	86.4274	(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	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
30.6763	27.2465	22.1583	16.7753	12.5397	10.5865	11.4391	14.8690	19.9572	25.3402	29.5758	31.5289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
400.0921	404.2438	393.7816	371.5089	343.3936	316.9692	299.3161	295.1644	305.6266	327.8993	356.0145	382.4389	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	(71)
Water heating gains (Table 5)												
117.5999	114.9432	109.8258	98.6099	91.7399	84.5590	80.1486	83.7926	88.0650	96.0330	106.7847	116.1659	(72)
Total internal gains												
661.9582	660.0234	639.3556	600.4840	561.2631	522.7046	501.4937	504.4160	524.2387	562.8624	605.9649	643.7237	(73)

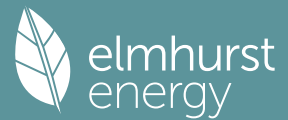
6. Solar gains

[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				9.6400	10.6334	0.6300	0.0000	0.7700	49.7256 (74)			
Southeast				8.5400	36.7938	0.6300	0.0000	0.7700	152.4278 (77)			
South				5.8500	46.7521	0.6300	0.0000	0.7700	132.6746 (78)			
East				4.0600	26.2379	0.6300	0.7000	1.0000	42.2802 (82)			
Solar gains	377.1083	656.8245	938.7700	1233.0308	1446.7914	1465.7434	1400.8540	1236.5395	1039.7327	736.5776	454.2841	321.0682 (83)
Total gains	1039.0665	1316.8479	1578.1256	1833.5148	2008.0545	1988.4481	1902.3477	1740.9555	1563.9713	1299.4400	1060.2490	964.7919 (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	24.6289	24.6626	24.6957	24.8524	24.8820	25.0204	25.0204	25.0463	24.9669	24.8820	24.8223	24.7602
alpha	2.6419	2.6442	2.6464	2.6568	2.6588	2.6680	2.6680	2.6698	2.6645	2.6588	2.6548	2.6507
util living area	0.9272	0.8767	0.8003	0.6831	0.5426	0.4040	0.3004	0.3391	0.5223	0.7535	0.8910	0.9380 (86)
MIT	18.7697	19.2382	19.7975	20.3509	20.7203	20.9071	20.9690	20.9565	20.8122	20.2783	19.4070	18.6628 (87)
Th 2	19.8682	19.8696	19.8709	19.8772	19.8784	19.8839	19.8839	19.8849	19.8818	19.8784	19.8760	19.8735 (88)
util rest of house	0.9162	0.8596	0.7744	0.6452	0.4923	0.3412	0.2277	0.2621	0.4545	0.7125	0.8727	0.9285 (89)
MIT 2	17.3180	17.8956	18.5736	19.2241	19.6295	19.8187	19.8689	19.8624	19.7378	19.1669	18.1221	17.1883 (90)
Living area fraction									fLA = Living area / (4) =			0.3226 (91)
MIT	17.7863	18.3287	18.9684	19.5876	19.9813	20.1698	20.2237	20.2153	20.0844	19.5254	18.5366	17.6639 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7863	18.3287	18.9684	19.5876	19.9813	20.1698	20.2237	20.2153	20.0844	19.5254	18.5366	17.6639 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8896	0.8312	0.7507	0.6347	0.4971	0.3577	0.2502	0.2854	0.4674	0.6980	0.8455	0.9034	(94)
Useful gains	924.3954	1094.5341	1184.6722	1163.6532	998.2056	711.2589	476.0551	496.9168	731.0281	907.0138	896.4072	871.5882	(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	1835.9002	1825.5682	1692.7506	1441.8292	1115.8811	746.3547	485.5824	510.7315	803.6313	1202.6678	1544.7463	1823.1430	(97)
Space heating kWh	678.1596	491.2549	378.0103	200.2867	87.5506	0.0000	0.0000	0.0000	0.0000	219.9666	466.8041	707.9568	(98a)
Space heating requirement - total per year (kWh/year)												3229.9897	
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	678.1596	491.2549	378.0103	200.2867	87.5506	0.0000	0.0000	0.0000	0.0000	219.9666	466.8041	707.9568	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3229.9897	
Space heating per m2										(98c) / (4) =		30.0185	(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 %)													89.0000	(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	678.1596	491.2549	378.0103	200.2867	87.5506	0.0000	0.0000	0.0000	0.0000	219.9666	466.8041	707.9568	(98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)	
Space heating fuel (main heating system)	761.9771	551.9718	424.7307	225.0412	98.3715	0.0000	0.0000	0.0000	0.0000	247.1535	524.4990	795.4571	(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	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(64)	
Efficiency of water heater (217)m	88.5039	88.4314	88.3046	88.0941	87.7833	87.3000	87.3000	87.3000	87.3000	88.1307	88.4125	88.5229	(216)	
Fuel for water heating, kWh/month	309.7010	273.8839	290.6882	254.3961	246.2838	221.8354	217.9183	227.2644	230.5375	256.2201	273.5148	306.0074	(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	26.8508	21.5407	19.3950	14.2096	10.9759	8.9674	10.0126	13.0148	16.9049	22.1801	25.0524	27.5971	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-23.4441	-37.5844	-61.9195	-77.7931	-89.3648	-85.2244	-83.6568	-75.8220	-62.4884	-45.9294	-27.0133	-19.5845	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-8.2292	-20.2529	-48.7237	-86.2986	-125.7570	-131.0323	-127.7553	-100.8705	-64.6188	-31.4136	-11.5652	-6.2250	(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													3629.2019	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													87.3000	
Water heating fuel used													3108.2509	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													216.7015	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1452.5668	(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													5587.5875	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3629.2019	3.6400	132.1029	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3108.2509	3.6400	113.1403	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	216.7015	16.4900	35.7341	(250)

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Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-689.8248	16.4900	-113.7521
PV Unit electricity exported	-762.7420	5.5900	-42.6373
Total			-156.3894 (252)
Total energy cost			230.7694 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5444 (257)
SAP value		91.1751
SAP rating (Section 12)		91 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	3629.2019	0.2100	762.1324 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	3108.2509	0.2100	652.7327 (264)
Space and water heating			1414.8651 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.7015	0.1443	31.2767 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-689.8248	0.1325	-91.3753
PV Unit electricity exported	-762.7420	0.1220	-93.0618
Total			-184.4371 (269)
Total CO ₂ , kg/year			1273.6340 (272)
CO ₂ emissions per m ²			11.8400 (273)
EI value			88.8161
EI rating			89 (274)
EI band			B

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	38.0700 (1b)	x 2.5000 (2b)	= 95.1750 (1b) - (3b)
First floor	39.8900 (1c)	x 2.8000 (2c)	= 111.6920 (1c) - (3c)
Second floor	29.6400 (1d)	x 2.9000 (2d)	= 85.9560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	292.8230 (5)

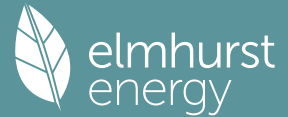
2. Ventilation rate

	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) = 0.1025 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.2900 (17)
Infiltration rate	0.2670 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2469 (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	0.2654	0.2531	0.2531	0.2346	0.2408	0.2099	0.2099	0.2037	0.2099	0.2346	0.2284	0.2469 (22b)
Effective ac	0.5352	0.5320	0.5320	0.5275	0.5290	0.5220	0.5220	0.5208	0.5220	0.5275	0.5261	0.5305 (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/Doors				24.0300	1.4151	34.0047			(27)				
Rooflights				4.0600	1.5918	6.4625			(27a)				
Ground Floor				38.0700	0.1300	4.9491	110.0000	4187.7000	(28a)				
External Wall		145.6000	24.0300	121.5700	0.1300	15.8041	9.0000	1094.1300	(29a)				
External Roof - Sloping		33.4700	4.0600	29.4100	0.1800	5.2938	9.0000	264.6900	(30)				
External Roof - Flat Roof		14.2500		14.2500	0.1200	1.7100	9.0000	128.2500	(30)				
Total net area of external elements Aum(A, m2)				231.3900					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		68.2243			(33)				
Main dwelling													
Party Wall 1				54.1200	0.0000	0.0000	70.0000	3788.4000	(32)				
Internal Walls - Timber				111.2600			9.0000	1001.3400	(32c)				
Internal Floor - 1st Floor				39.8900			18.0000	718.0200	(32d)				
Internal Floor - 2nd Floor				25.6400			18.0000	461.5200	(32d)				
Internal Ceiling - G Floor				29.5600			9.0000	266.0400	(32e)				
Internal Ceiling - 1st Floor				17.7600			9.0000	159.8400	(32e)				
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =		12069.9300	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								112.1741	(35)				
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
E1 Steel lintel with perforated steel base plate					17.0000	0.0440	0.7480						
E3 Sill					11.6000	0.0640	0.7424						
E4 Jamb					46.6000	0.0480	2.2368						
E5 Ground floor (normal)					19.8000	0.0510	1.0098						
E6 Intermediate floor within a dwelling					36.4000	0.0130	0.4732						
E11 Eaves (insulation at rafter level)					4.8000	0.0540	0.2592						
E13 Gable (insulation at rafter level)					9.6000	0.0620	0.5952						
E15 Flat roof with parapet					7.0000	0.0300	0.2100						
E16 Corner (normal)					12.1000	0.0300	0.3630						
E18 Party wall between dwellings					2.5000	0.0870	0.2175						
E25 Staggered party wall between dwellings					14.6000	0.2400	3.5040						
P1 Party wall - Ground floor					7.6000	0.0320	0.2432						
P2 Party wall - Intermediate floor within a dwelling					13.2000	0.0000	0.0000						
P4 Party wall - Roof (insulation at ceiling level)					3.3000	0.4800	1.5840						
P5 Party wall - Roof (insulation at rafter level)					4.8000	0.4800	2.3040						
R1 Head of roof window					3.1000	0.0240	0.0744						
R2 Sill of roof window					3.1000	0.0240	0.0744						
R3 Jamb of roof window					4.8000	0.0240	0.1152						
R4 Ridge (vaulted ceiling)					4.8000	0.0120	0.0576						
E17 Corner (inverted - internal area greater than external area)					2.5000	-0.0040	-0.0100						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								14.8019	(36)				
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		83.0262	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	51.7203	51.4110	51.4110	50.9746	51.1164	50.4443	50.4443	50.3209	50.4443	50.9746	50.8365	51.2618	(38)
Average = Sum(39)m / 12 =	134.7465	134.4371	134.4371	134.0007	134.1425	133.4705	133.4705	133.3471	133.4705	134.0007	133.8626	134.2880	(39)
												133.9728	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.2523	1.2494	1.2494	1.2454	1.2467	1.2404	1.2404	1.2393	1.2404	1.2454	1.2441	1.2480	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

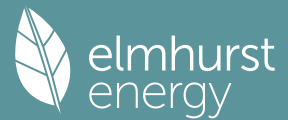
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.7996 (42)
Hot water usage for mixer showers													
71.1603	70.0909	68.5326	65.5510	63.3507	60.8969	59.5022	61.0487	62.7440	65.3786	68.4242	70.8877	70.8877	(42a)
Hot water usage for baths													
30.7245	30.2682	29.6256	28.4408	27.5537	26.5700	26.0386	26.6767	27.3715	28.4241	29.6332	30.6206	30.6206	(42b)
Hot water usage for other uses													
43.3010	41.7264	40.1518	38.5772	37.0026	35.4281	35.4281	37.0026	38.5772	40.1518	41.7264	43.3010	43.3010	(42c)
Average daily hot water use (litres/day)													133.4584 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
145.1858	142.0855	138.3100	132.5691	127.9070	122.8950	120.9689	124.7281	128.6927	133.9545	139.7839	144.8093	144.8093	(44)
Energy conte	229.9388	202.3279	212.5774	181.4805	172.1875	151.1137	146.3014	154.4394	158.6909	181.7750	199.1477	226.7363	(45)
Energy content (annual)										Total = Sum(45)m =		2216.7165	
Distribution loss (46)m = 0.15 x (45)m													
34.4908	30.3492	31.8866	27.2221	25.8281	22.6671	21.9452	23.1659	23.8036	27.2662	29.8722	34.0105	34.0105	(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	44.1587	39.8714	44.1136	42.6275	44.0086	42.5486	43.9413	43.9624	42.5683	44.0335	42.6735	44.1504	(61)
Total heat required for water heating calculated for each month	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(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	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(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	87.4943	77.2419	81.7104	70.9991	68.2545	60.8825	59.6305	62.3417	63.4068	71.4486	76.8850	86.4274	(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	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6763	27.2465	22.1583	16.7753	12.5397	10.5865	11.4391	14.8690	19.9572	25.3402	29.5758	31.5289	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	400.0921	404.2438	393.7816	371.5089	343.3936	316.9692	299.3161	295.1644	305.6266	327.8993	356.0145	382.4389 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974 (69)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851 (71)
Water heating gains (Table 5)	117.5999	114.9432	109.8258	98.6099	91.7399	84.5590	80.1486	83.7926	88.0650	96.0330	106.7847	116.1659 (72)
Total internal gains	661.9582	660.0234	639.3556	600.4840	561.2631	522.7046	501.4937	504.4160	524.2387	562.8624	605.9649	643.7237 (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					9.6400	12.7650	0.6300	0.0000			0.7700	59.6940 (74)	
Southeast					8.5400	43.0593	0.6300	0.0000			0.7700	178.3840 (77)	
South					5.8500	54.2217	0.6300	0.0000			0.7700	153.8723 (78)	
East					4.0600	31.9987	0.6300	0.7000			1.0000	51.5631 (82)	

Solar gains	443.5133	676.0752	963.4826	1293.4541	1486.2052	1595.7951	1508.8817	1360.2604	1140.4725	814.8190	526.4950	379.7007 (83)	
Total gains	1105.4716	1336.0986	1602.8382	1893.9381	2047.4683	2118.4997	2010.3754	1864.6764	1664.7112	1377.6814	1132.4600	1023.4244 (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	24.8820	24.9392	24.9392	25.0204	24.9940	25.1199	25.1199	25.1431	25.1199	25.0204	25.0463	24.9669
alpha	2.6588	2.6626	2.6626	2.6680	2.6663	2.6747	2.6747	2.6762	2.6747	2.6680	2.6698	2.6645
util living area	0.9085	0.8601	0.7729	0.6348	0.4797	0.3163	0.2161	0.2389	0.4432	0.6980	0.8602	0.9213 (86)
MIT	19.0545	19.4469	19.9914	20.5116	20.8212	20.9588	20.9898	20.9865	20.8919	20.4667	19.6871	18.9591 (87)
Th 2	19.8784	19.8807	19.8807	19.8839	19.8828	19.8878	19.8878	19.8887	19.8878	19.8839	19.8849	19.8818 (88)
util rest of house	0.8947	0.8405	0.7434	0.5925	0.4248	0.2524	0.1445	0.1626	0.3718	0.6497	0.8369	0.9091 (89)
MIT 2	17.6800	18.1607	18.8129	19.4098	19.7357	19.8639	19.8846	19.8843	19.8141	19.3819	18.4703	17.5653 (90)
Living area fraction	18.1234	18.5756	19.1931	19.7653	20.0859	20.2171	20.2411	20.2398	20.1618	19.7318	18.8628	18.0149 (92)
MIT	18.1234	18.5756	19.1931	19.7653	20.0859	20.2171	20.2411	20.2398	20.1618	19.7318	18.8628	18.0149 (93)
Temperature adjustment												0.0000
adjusted MIT	18.1234	18.5756	19.1931	19.7653	20.0859	20.2171	20.2411	20.2398	20.1618	19.7318	18.8628	18.0149 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8672	0.8131	0.7230	0.5877	0.4351	0.2717	0.1675	0.1870	0.3900	0.6425	0.8110	0.8825 (94)
Ext temp.	958.6765	1086.4091	1158.8341	1113.1267	890.8687	575.5267	336.7479	348.7119	649.2576	885.1473	918.4421	903.1221 (95)
Heat loss rate W	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)
Space heating kWh	1754.8588	1730.9651	1585.4257	1321.9518	963.9292	589.5573	339.1670	352.0153	688.9504	1103.0722	1454.1260	1734.3187 (97)
Space heating requirement - total per year (kWh/year)	592.3596	433.1417	317.3842	150.3541	54.3571	0.0000	0.0000	0.0000	0.0000	162.1362	385.6924	618.4103 (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)	592.3596	433.1417	317.3842	150.3541	54.3571	0.0000	0.0000	0.0000	0.0000	162.1362	385.6924	618.4103 (98c)
Space heating requirement after solar 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 (99)
Space heating per m2												25.2215 (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 %)												89.0000 (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
592.3596	433.1417	317.3842	150.3541	54.3571	0.0000	0.0000	0.0000	0.0000	0.0000	162.1362	385.6924	618.4103 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	665.5726	486.6760	356.6114	168.9372	61.0754	0.0000	0.0000	0.0000	0.0000	182.1755	433.3623	694.8431 (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	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868 (64)
Efficiency of water heater (217)m	88.4551	88.3828	88.2318	87.9747	87.6363	87.3000	87.3000	87.3000	87.3000	88.0025	88.3371	88.4752 (217)
Fuel for water heating, kWh/month	309.8720	274.0345	290.9281	254.7414	246.6969	221.8354	217.9183	227.2644	230.5375	256.5932	273.7482	306.1725 (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)

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Lighting	26.8508	21.5407	19.3950	14.2096	10.9759	8.9674	10.0126	13.0148	16.9049	22.1801	25.0524	27.5971	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.7296	-39.5441	-64.4162	-81.1173	-91.3116	-89.4438	-87.4042	-80.6995	-67.3313	-50.6776	-31.3855	-23.3357	(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	-10.9681	-22.2084	-52.6640	-94.5888	-132.4623	-148.1945	-142.7525	-116.9974	-75.8759	-37.9185	-15.0531	-8.3734	(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												3049.2534	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												3110.3423	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												216.7015	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1592.4533	(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												4869.8439	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3049.2534	5.6000	170.7582 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3110.3423	5.6000	174.1792 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	216.7015	26.0600	56.4724 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.3964	26.0600	-191.3837
PV Unit electricity exported	-858.0569	5.8100	-49.8531
Total			-241.2368 (252)
Total energy cost			281.5846 (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	3049.2534	0.2100	640.3432 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3110.3423	0.2100	653.1719 (264)
Space and water heating			1293.5151 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.7015	0.1443	31.2767 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.3964	0.1327	-97.4785
PV Unit electricity exported	-858.0569	0.1220	-104.6405
Total			-202.1190 (269)
Total CO2, kg/year			1134.6020 (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	3049.2534	1.1300	3445.6564 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3110.3423	1.1300	3514.6867 (278)
Space and water heating			6960.3431 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	216.7015	1.5338	332.3840 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.3964	1.4904	-1094.5790
PV Unit electricity exported	-858.0569	0.4474	-383.8778
Total			-1478.4568 (283)
Total Primary energy kWh/year			5944.3711 (286)

SAP 10 EPC IMPROVEMENTS

As Built

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Current energy efficiency rating:
Current environmental impact rating:

B 91
B 89

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.5 -£ 26 -159 kg (14.1%)

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

Potential energy efficiency rating: B 91
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£79	£79	£0
Mains gas	£444	£444	£0
Space heating	£292	£292	£0
Water heating	£174	£174	£0
Lighting	£56	£56	£0
Generated (PV)	-£241	-£241	£0
Total cost of fuels	£282	£282	£0
Total cost of uses	£281	£281	£0
Delivered energy	45 kWh/m²	45 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	55 kWh/m²	55 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

Main dwelling	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	38.0700 (1b)	x 2.5000 (2b)	= 95.1750 (1b) - (3b)
First floor	39.8900 (1c)	x 2.8000 (2c)	= 111.6920 (1c) - (3c)
Second floor	29.6400 (1d)	x 2.9000 (2d)	= 85.9560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	292.8230 (5)

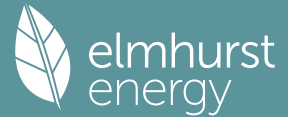
2. Ventilation rate

	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) = 0.1025 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 3.2900 (17)
Infiltration rate 0.2670 (18)
Number of sides sheltered 1 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2469 (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	0.3148	0.3087	0.3025	0.2716	0.2654	0.2346	0.2346	0.2284	0.2469	0.2654	0.2778	0.2901 (22b)
Effective ac	0.5496	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421 (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								
Windows/Doors			24.0300	1.4151	34.0047			(27)
Rooflights			4.0600	1.5918	6.4625			(27a)
Ground Floor			38.0700	0.1300	4.9491	110.0000	4187.7000	(28a)
External Wall	145.6000	24.0300	121.5700	0.1300	15.8041	9.0000	1094.1300	(29a)
External Roof - Sloping	33.4700	4.0600	29.4100	0.1800	5.2938	9.0000	264.6900	(30)
External Roof - Flat Roof	14.2500		14.2500	0.1200	1.7100	9.0000	128.2500	(30)
Total net area of external elements Aum(A, m2)			231.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2243			(33)
Main dwelling								
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000	(32)
Internal Walls - Timber			111.2600			9.0000	1001.3400	(32c)
Internal Floor - 1st Floor			39.8900			18.0000	718.0200	(32d)
Internal Floor - 2nd Floor			25.6400			18.0000	461.5200	(32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400	(32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12069.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 112.1741 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	17.0000	0.0440	0.7480
E3 Sill	11.6000	0.0640	0.7424
E4 Jamb	46.6000	0.0480	2.2368
E5 Ground floor (normal)	19.8000	0.0510	1.0098
E6 Intermediate floor within a dwelling	36.4000	0.0130	0.4732
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592
E13 Gable (insulation at rafter level)	9.6000	0.0620	0.5952
E15 Flat roof with parapet	7.0000	0.0300	0.2100
E16 Corner (normal)	12.1000	0.0300	0.3630
E18 Party wall between dwellings	2.5000	0.0870	0.2175
E25 Staggered party wall between dwellings	14.6000	0.2400	3.5040
P1 Party wall - Ground floor	7.6000	0.0320	0.2432
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.4800	1.5840
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040
R1 Head of roof window	3.1000	0.0240	0.0744
R2 Sill of roof window	3.1000	0.0240	0.0744
R3 Jamb of roof window	4.8000	0.0240	0.1152
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0040	-0.0100

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.8019 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 83.0262 (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	53.1049	52.9190	52.7367	51.8805	51.7203	50.9746	50.9746	50.8365	51.2618	51.7203	52.0444	52.3831
Average = Sum(39)m / 12 =	136.1311	135.9451	135.7628	134.9066	134.7465	134.0007	134.0007	133.8626	134.2880	134.7465	135.0705	135.4093
												134.9059
HLP	1.2652	1.2634	1.2617	1.2538	1.2523	1.2454	1.2454	1.2441	1.2480	1.2523	1.2553	1.2585
HLP (average)												1.2538
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

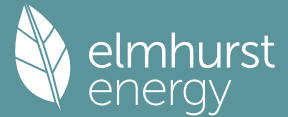
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7996 (42)
Hot water usage for mixer showers													
71.1603	70.0909	68.5326	65.5510	63.3507	60.8969	59.5022	61.0487	62.7440	65.3786	68.4242	70.8877	(42a)	
Hot water usage for baths													
30.7245	30.2682	29.6256	28.4408	27.5537	26.5700	26.0386	26.6767	27.3715	28.4241	29.6332	30.6206	(42b)	
Hot water usage for other uses													
43.3010	41.7264	40.1518	38.5772	37.0026	35.4281	35.4281	37.0026	38.5772	40.1518	41.7264	43.3010	(42c)	
Average daily hot water use (litres/day)												133.4584 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	145.1858	142.0855	138.3100	132.5691	127.9070	122.8950	120.9689	124.7281	128.6927	133.9545	139.7839	144.8093	(44)
Energy conte	229.9388	202.3279	212.5774	181.4805	172.1875	151.1137	146.3014	154.4394	158.6909	181.7750	199.1477	226.7363	(45)
Energy content (annual)										Total = Sum(45)m =		2216.7165	
Distribution loss (46)m = 0.15 x (45)m													
34.4908	30.3492	31.8866		27.2221	25.8281	22.6671	21.9452	23.1659	23.8036	27.2662	29.8722	34.0105	(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	44.1587	39.8714	44.1136	42.6275	44.0086	42.5486	43.9413	43.9624	42.5683	44.0335	42.6735	44.1504	(61)
Total heat required for water heating calculated for each month													
274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(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													
274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(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													
87.4943	77.2419	81.7104	70.9991	68.2545	60.8825	59.6305	62.3417	63.4068	71.4486	76.8850	86.4274	(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	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6763	27.2465	22.1583	16.7753	12.5397	10.5865	11.4391	14.8690	19.9572	25.3402	29.5758	31.5289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	400.0921	404.2438	393.7816	371.5089	343.3936	316.9692	299.3161	295.1644	305.6266	327.8993	356.0145	382.4389 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974 (69)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851 (71)
Water heating gains (Table 5)	117.5999	114.9432	109.8258	98.6099	91.7399	84.5590	80.1486	83.7926	88.0650	96.0330	106.7847	116.1659 (72)
Total internal gains	661.9582	660.0234	639.3556	600.4840	561.2631	522.7046	501.4937	504.4160	524.2387	562.8624	605.9649	643.7237 (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					9.6400	10.6334		0.6300	0.0000	0.7700		49.7256 (74)	
Southeast					8.5400	36.7938		0.6300	0.0000	0.7700		152.4278 (77)	
South					5.8500	46.7521		0.6300	0.0000	0.7700		132.6746 (78)	
East					4.0600	26.2379		0.6300	0.7000	1.0000		42.2802 (82)	
Solar gains	377.1083	656.8245	938.7700	1233.0308	1446.7914	1465.7434	1400.8540	1236.5395	1039.7327	736.5776	454.2841	321.0682 (83)	
Total gains	1039.0665	1316.8479	1578.1256	1833.5148	2008.0545	1988.4481	1902.3477	1740.9555	1563.9713	1299.4400	1060.2490	964.7919 (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	24.6289	24.6626	24.6957	24.8524	24.8820	25.0204	25.0204	25.0463	24.9669	24.8820	24.8223	24.7602	
alpha	2.6419	2.6442	2.6464	2.6568	2.6588	2.6680	2.6680	2.6698	2.6645	2.6588	2.6548	2.6507	
util living area	0.9272	0.8767	0.8003	0.6831	0.5426	0.4040	0.3004	0.3391	0.5223	0.7535	0.8910	0.9380 (86)	
MIT	18.7697	19.2382	19.7975	20.3509	20.7203	20.9071	20.9690	20.9565	20.8122	20.2783	19.4070	18.6628 (87)	
Th 2	19.8682	19.8696	19.8709	19.8772	19.8784	19.8839	19.8839	19.8849	19.8818	19.8784	19.8760	19.8735 (88)	
util rest of house	0.9162	0.8596	0.7744	0.6452	0.4923	0.3412	0.2277	0.2621	0.4545	0.7125	0.8727	0.9285 (89)	
MIT 2	17.3180	17.8956	18.5736	19.2241	19.6295	19.8187	19.8689	19.8624	19.7378	19.1669	18.1221	17.1883 (90)	
Living area fraction	17.7863	18.3287	18.9684	19.5876	19.9813	20.1698	20.2237	20.2153	20.0844	19.5254	18.5366	17.6639 (92)	
MIT	17.7863	18.3287	18.9684	19.5876	19.9813	20.1698	20.2237	20.2153	20.0844	19.5254	18.5366	17.6639 (93)	
Temperature adjustment												0.0000	
adjusted MIT	17.7863	18.3287	18.9684	19.5876	19.9813	20.1698	20.2237	20.2153	20.0844	19.5254	18.5366	17.6639 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8896	0.8312	0.7507	0.6347	0.4971	0.3577	0.2502	0.2854	0.4674	0.6980	0.8455	0.9034 (94)	
Useful gains	924.3954	1094.5341	1184.6722	1163.6532	998.2056	711.2589	476.0551	496.9168	731.0281	907.0138	896.4072	871.5882 (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	1835.9002	1825.5682	1692.7506	1441.8292	1115.8811	746.3547	485.5824	510.7315	803.6313	1202.6678	1544.7463	1823.1430 (97)	
Space heating kWh	678.1596	491.2549	378.0103	200.2867	87.5506	0.0000	0.0000	0.0000	0.0000	219.9666	466.8041	707.9568 (98a)	
Space heating requirement - total per year (kWh/year)												3229.9897	
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	678.1596	491.2549	378.0103	200.2867	87.5506	0.0000	0.0000	0.0000	0.0000	219.9666	466.8041	707.9568 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3229.9897	
Space heating per m2										(98c) / (4) =		30.0185 (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 %)													89.0000 (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	678.1596	491.2549	378.0103	200.2867	87.5506	0.0000	0.0000	0.0000	0.0000	219.9666	466.8041	707.9568 (98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)	
Space heating fuel (main heating system)	761.9771	551.9718	424.7307	225.0412	98.3715	0.0000	0.0000	0.0000	0.0000	247.1535	524.4990	795.4571 (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	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868 (64)	
Efficiency of water heater (217)m	88.5039	88.4314	88.3046	88.0941	87.7833	87.3000	87.3000	87.3000	87.3000	88.1307	88.4125	87.3000 (216)	
Fuel for water heating, kWh/month	309.7010	273.8839	290.6882	254.3961	246.2838	221.8354	217.9183	227.2644	230.5375	256.2201	273.5148	306.0074 (219)	
Space cooling fuel requirement													

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(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	26.8508	21.5407	19.3950	14.2096	10.9759	8.9674	10.0126	13.0148	16.9049	22.1801	25.0524	27.5971	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4441	-37.5844	-61.9195	-77.7931	-89.3648	-85.2244	-83.6568	-75.8220	-62.4884	-45.9294	-27.0133	-19.5845	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.2292	-20.2529	-48.7237	-86.2986	-125.7570	-131.0323	-127.7553	-100.8705	-64.6188	-31.4136	-11.5652	-6.2250	(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												3629.2019	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												3108.2509	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												216.7015	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1452.5668	(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												5587.5875	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3629.2019	3.6400	132.1029	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3108.2509	3.6400	113.1403	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	216.7015	16.4900	35.7341	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-689.8248	16.4900	-113.7521	
PV Unit electricity exported	-762.7420	5.5900	-42.6373	
Total			-156.3894	(252)
Total energy cost			230.7694	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.5444	(257)
SAP value		91.1751	
SAP rating (Section 12)		91	(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	3629.2019	0.2100	762.1324	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3108.2509	0.2100	652.7327	(264)
Space and water heating			1414.8651	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.7015	0.1443	31.2767	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-689.8248	0.1325	-91.3753	
PV Unit electricity exported	-762.7420	0.1220	-93.0618	
Total			-184.4371	(269)
Total CO2, kg/year			1273.6340	(272)
CO2 emissions per m2			11.8400	(273)
EI value			88.8161	
EI rating			89	(274)
EI band			B	

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Main dwelling				
Ground floor	38.0700 (1b)	x 2.5000 (2b)	= 95.1750 (1b)	- (3b)
First floor	39.8900 (1c)	x 2.8000 (2c)	= 111.6920 (1c)	- (3c)
Second floor	29.6400 (1d)	x 2.9000 (2d)	= 85.9560 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.6000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 292.8230	(5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1025 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.2900 (17)
Infiltration rate		0.2670 (18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2469 (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													
Effective ac	0.2654	0.2531	0.2531	0.2346	0.2408	0.2099	0.2099	0.2037	0.2099	0.2346	0.2284	0.2469	(22b)
	0.5352	0.5320	0.5320	0.5275	0.5290	0.5220	0.5220	0.5208	0.5220	0.5275	0.5261	0.5305	(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/Doors			24.0300	1.4151	34.0047			(27)
Rooflights			4.0600	1.5918	6.4625			(27a)
Ground Floor			38.0700	0.1300	4.9491	110.0000	4187.7000	(28a)
External Wall	145.6000	24.0300	121.5700	0.1300	15.8041	9.0000	1094.1300	(29a)
External Roof - Sloping	33.4700	4.0600	29.4100	0.1800	5.2938	9.0000	264.6900	(30)
External Roof - Flat Roof	14.2500		14.2500	0.1200	1.7100	9.0000	128.2500	(30)
Total net area of external elements Aum(A, m ²)			231.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2243			(33)
Main dwelling								
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000	(32)
Internal Walls - Timber			111.2600			9.0000	1001.3400	(32c)
Internal Floor - 1st Floor			39.8900			18.0000	718.0200	(32d)
Internal Floor - 2nd Floor			25.6400			18.0000	461.5200	(32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400	(32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12069.9300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 112.1741 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	17.0000	0.0440	0.7480	
E3 Sill	11.6000	0.0640	0.7424	
E4 Jamb	46.6000	0.0480	2.2368	
E5 Ground floor (normal)	19.8000	0.0510	1.0098	
E6 Intermediate floor within a dwelling	36.4000	0.0130	0.4732	
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592	
E13 Gable (insulation at rafter level)	9.6000	0.0620	0.5952	
E15 Flat roof with parapet	7.0000	0.0300	0.2100	
E16 Corner (normal)	12.1000	0.0300	0.3630	
E18 Party wall between dwellings	2.5000	0.0870	0.2175	
E25 Staggered party wall between dwellings	14.6000	0.2400	3.5040	
P1 Party wall - Ground floor	7.6000	0.0320	0.2432	
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.4800	1.5840	
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040	
R1 Head of roof window	3.1000	0.0240	0.0744	
R2 Sill of roof window	3.1000	0.0240	0.0744	
R3 Jamb of roof window	4.8000	0.0240	0.1152	
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0040	-0.0100	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.8019 (36)

Point Thermal bridges (36a) = 0.0000

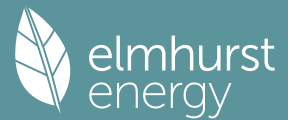
Total fabric heat loss (33) + (36) + (36a) = 83.0262 (37)

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	51.7203	51.4110	51.4110	50.9746	51.1164	50.4443	50.4443	50.3209	50.4443	50.9746	50.8365	51.2618	(38)
Heat transfer coeff	134.7465	134.4371	134.4371	134.0007	134.1425	133.4705	133.4705	133.3471	133.4705	134.0007	133.8626	134.2880	(39)
Average = Sum(39)m / 12 =												133.9728	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2523	1.2494	1.2494	1.2454	1.2467	1.2404	1.2404	1.2393	1.2404	1.2454	1.2441	1.2480	(40)
HLP (average)												1.2451	

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

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7996 (42)
Hot water usage for mixer showers	71.1603	70.0909	68.5326	65.5510	63.3507	60.8969	59.5022	61.0487	62.7440	65.3786	68.4242	70.8877 (42a)
Hot water usage for baths	30.7245	30.2682	29.6256	28.4408	27.5537	26.5700	26.0386	26.6767	27.3715	28.4241	29.6332	30.6206 (42b)
Hot water usage for other uses	43.3010	41.7264	40.1518	38.5772	37.0026	35.4281	35.4281	37.0026	38.5772	40.1518	41.7264	43.3010 (42c)
Average daily hot water use (litres/day)												133.4584 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	145.1858	142.0855	138.3100	132.5691	127.9070	122.8950	120.9689	124.7281	128.6927	133.9545	139.7839	144.8093 (44)
Energy content (annual)	229.9388	202.3279	212.5774	181.4805	172.1875	151.1137	146.3014	154.4394	158.6909	181.7750	199.1477	226.7363 (45)
Distribution loss (46)m = 0.15 x (45)m	34.4908	30.3492	31.8866	27.2221	25.8281	22.6671	21.9452	23.1659	23.8036	27.2662	29.8722	34.0105 (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	44.1587	39.8714	44.1136	42.6275	44.0086	42.5486	43.9413	43.9624	42.5683	44.0335	42.6735	44.1504 (61)
Total heat required for water heating calculated for each month	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868 (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	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868 (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	87.4943	77.2419	81.7104	70.9991	68.2545	60.8825	59.6305	62.3417	63.4068	71.4486	76.8850	86.4274 (65)

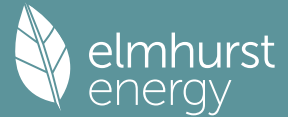
5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776	167.9776 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6763	27.2465	22.1583	16.7753	12.5397	10.5865	11.4391	14.8690	19.9572	25.3402	29.5758	31.5289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	400.0921	404.2438	393.7816	371.5089	343.9336	316.9692	299.3161	295.1644	305.6266	327.8993	356.0145	382.4389 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974	54.5974 (69)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851	-111.9851 (71)
Water heating gains (Table 5)	117.5999	114.9432	109.8258	98.6099	91.7399	84.5590	80.1486	83.7926	88.0650	96.0330	106.7847	116.1659 (72)
Total internal gains	661.9582	660.0234	639.3556	600.4840	561.2631	522.7046	501.4937	504.4160	524.2387	562.8624	605.9649	643.7237 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	9.6400											59.6940 (74)
Southeast	8.5400											178.3840 (77)
South	5.8500											153.8723 (78)
East	4.0600											51.5631 (82)

Solar gains	443.5133	676.0752	963.4826	1293.4541	1486.2052	1595.7951	1508.8817	1360.2604	1140.4725	814.8190	526.4950	379.7007 (83)
Total gains	1105.4716	1336.0986	1602.8382	1893.9381	2047.4683	2118.4997	2010.3754	1864.6764	1664.7112	1377.6814	1132.4600	1023.4244 (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	24.8820	24.9392	24.9392	25.0204	24.9940	25.1199	25.1199	25.1431	25.1199	25.0204	25.0463	24.9669
alpha	2.6588	2.6626	2.6626	2.6680	2.6663	2.6747	2.6747	2.6762	2.6747	2.6680	2.6698	2.6645
util living area	0.9085	0.8601	0.7729	0.6348	0.4797	0.3163	0.2161	0.2389	0.4432	0.6980	0.8602	0.9213 (86)
MIT	19.0545	19.4469	19.9914	20.5116	20.8212	20.9588	20.9898	20.9865	20.8919	20.4667	19.6871	18.9591 (87)
Th 2	19.8784	19.8807	19.8807	19.8839	19.8828	19.8878	19.8878	19.8887	19.8878	19.8839	19.8849	19.8818 (88)
util rest of house	0.8947	0.8405	0.7434	0.5925	0.4248	0.2524	0.1445	0.1626	0.3718	0.6497	0.8369	0.9091 (89)
MIT 2	17.6800	18.1607	18.8129	19.4098	19.7357	19.8639	19.8846	19.8843	19.8141	19.3819	18.4703	17.5653 (90)
Living area fraction	18.1234	18.5756	19.1931	19.7653	20.0859	20.2171	20.2411	20.2398	20.1618	19.7318	18.8628	18.0149 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1234	18.5756	19.1931	19.7653	20.0859	20.2171	20.2411	20.2398	20.1618	19.7318	18.8628	18.0149 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8672	0.8131	0.7230	0.5877	0.4351	0.2717	0.1675	0.1870	0.3900	0.6425	0.8110	0.8825	(94)
Useful gains	958.6765	1086.4091	1158.8341	1113.1267	890.8687	575.5267	336.7479	348.7119	649.2576	885.1473	918.4421	903.1221	(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	1754.8588	1730.9651	1585.4257	1321.9518	963.9292	589.5573	339.1670	352.0153	688.9504	1103.0722	1454.1260	1734.3187	(97)
Space heating kWh	592.3596	433.1417	317.3842	150.3541	54.3571	0.0000	0.0000	0.0000	0.0000	162.1362	385.6924	618.4103	(98a)
Space heating requirement - total per year (kWh/year)												2713.8355	
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	592.3596	433.1417	317.3842	150.3541	54.3571	0.0000	0.0000	0.0000	0.0000	162.1362	385.6924	618.4103	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2713.8355	
Space heating per m2											(98c) / (4) =	25.2215	(99)

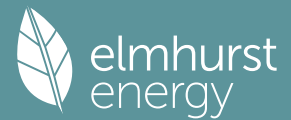
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)												89.0000	(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	592.3596	433.1417	317.3842	150.3541	54.3571	0.0000	0.0000	0.0000	0.0000	162.1362	385.6924	618.4103	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	665.5726	486.6760	356.6114	168.9372	61.0754	0.0000	0.0000	0.0000	0.0000	182.1755	433.3623	694.8431	(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	274.0975	242.1993	256.6910	224.1080	216.1960	193.6623	190.2426	198.4018	201.2592	225.8085	241.8212	270.8868	(64)
Efficiency of water heater (217)m	88.4551	88.3828	88.2318	87.9747	87.6363	87.3000	87.3000	87.3000	87.3000	88.0025	88.3371	87.3000	(216)
Fuel for water heating, kWh/month	309.8720	274.0345	290.9281	254.7414	246.6969	221.8354	217.9183	227.2644	230.5375	256.5932	273.7482	306.1725	(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	26.8508	21.5407	19.3950	14.2096	10.9759	8.9674	10.0126	13.0148	16.9049	22.1801	25.0524	27.5971	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.7296	-39.5441	-64.4162	-81.1173	-91.3116	-89.4438	-87.4042	-80.6995	-67.3313	-50.6776	-31.3855	-23.3357	(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	-10.9681	-22.2084	-52.6640	-94.5888	-132.4623	-148.1945	-142.7525	-116.9974	-75.8759	-37.9185	-15.0531	-8.3734	(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												3049.2534	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												3110.3423	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												216.7015	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1592.4533	(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												4869.8439	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3049.2534	5.6000	170.7582	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3110.3423	5.6000	174.1792	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	216.7015	26.0600	56.4724	(250)
Additional standing charges			99.0000	(251)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.3964	26.0600	-191.3837
PV Unit electricity exported	-858.0569	5.8100	-49.8531
Total			-241.2368 (252)
Total energy cost			281.5846 (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	3049.2534	0.2100	640.3432 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3110.3423	0.2100	653.1719 (264)
Space and water heating			1293.5151 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.7015	0.1443	31.2767 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.3964	0.1327	-97.4785
PV Unit electricity exported	-858.0569	0.1220	-104.6405
Total			-202.1190 (269)
Total CO2, kg/year			1134.6020 (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	3049.2534	1.1300	3445.6564 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3110.3423	1.1300	3514.6867 (278)
Space and water heating			6960.3431 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	216.7015	1.5338	332.3840 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.3964	1.4904	-1094.5790
PV Unit electricity exported	-858.0569	0.4474	-383.8778
Total			-1478.4568 (283)
Total Primary energy kWh/year			5944.3711 (286)