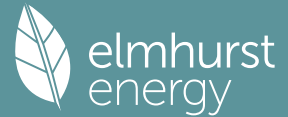


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Property Reference	7358-0001-GF-110NR				Issued on Date	14/10/2025
Assessment Reference	Proposed		Prop Type Ref			
Property	110 Norcot Road, Reading, RG30 6BT					
SAP Rating	98 A	DER	11.50	TER	11.74	
Environmental	91 B	% DER < TER				2.04
CO ₂ Emissions (t/year)	0.59	DFEE	43.12	TFEE	46.26	
Compliance Check	See BREL	% DFEE < TFEE				6.79
% DPER < TPER	1.66	DPER	61.75	TPER	62.79	
Assessor Details	Mr. James Turner				Assessor ID	7358-0001
Client	052, Greg Farrell					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	64.9900 (1b)	2.4000 (2b)	155.9760 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.9900		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	155.9760 (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	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1282 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.3787 (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) = 0.3503 (21)

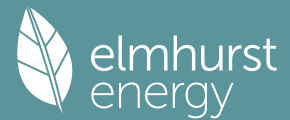
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4467	0.4379	0.4291	0.3854	0.3766	0.3328	0.3328	0.3240	0.3503	0.3766	0.3941	0.4116 (22b)
Effective ac	0.5998	0.5959	0.5921	0.5742	0.5709	0.5554	0.5554	0.5525	0.5614	0.5709	0.5777	0.5847 (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							
Entrance door			1.9700	1.2000	2.3640		(26)
Glazed door			3.8000	1.3258	5.0379		(27)
Window			11.9300	1.1450	13.6603		(27)
Heat Loss Floor 1			64.9900	0.1200	7.7988	65.5200	4258.1448 (28a)
External Wall 1	80.6400	17.7000	62.9400	0.1700	10.6998	55.6400	3501.9816 (29a)
External Roof 1	64.9900		64.9900	0.1043	6.7762	12.1700	790.9283 (30)
Total net area of external elements Aum(A, m ²)			210.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.3370		(33)
Main dwelling							
Internal Wall 1			96.8400			75.0000	7263.0000 (32c)
Internal Wall 2			9.7400			9.0000	87.6600 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	15901.7147 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.6794 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.4200	0.1750	2.8735	
E3 Sill				15.4800	0.0230	0.3560	
E4 Jamb				24.0000	0.0180	0.4320	
E5 Ground floor (normal)				33.6000	0.0530	1.7808	

7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, T_{hi} (°C)	21.0000 (85)

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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	52.1724	52.2955	52.4168	52.9941	53.1035	53.6188	53.6188	53.7154	53.4192	53.1035	52.8826	52.6536
alpha	4.4782	4.4864	4.4945	4.5329	4.5402	4.5746	4.5746	4.5810	4.5613	4.5402	4.5255	4.5102
util living area	0.9898	0.9778	0.9524	0.8819	0.7478	0.5638	0.4168	0.4658	0.7050	0.9184	0.9796	0.9918 (86)
MIT	19.8897	20.0738	20.3172	20.6131	20.8167	20.9078	20.9274	20.9243	20.8663	20.5912	20.1890	19.8600 (87)
Th 2	19.8387	19.8411	19.8435	19.8545	19.8566	19.8663	19.8663	19.8681	19.8626	19.8566	19.8524	19.8480 (88)
util rest of house	0.9866	0.9710	0.9378	0.8475	0.6837	0.4731	0.3119	0.3554	0.6147	0.8862	0.9721	0.9892 (89)
MIT 2	18.5655	18.7992	19.1032	19.4626	19.6796	19.7667	19.7781	19.7788	19.7350	19.4496	18.9560	18.5351 (90)
Living area fraction									FLA = Living area /	(4) =		0.4531 (91)
MIT	19.1655	19.3768	19.6533	19.9840	20.1949	20.2838	20.2989	20.2979	20.2476	19.9669	19.5147	19.1355 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0155	19.2268	19.5033	19.8340	20.0449	20.1338	20.1489	20.1479	20.0976	19.8169	19.3647	18.9855 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9836	0.9665	0.9326	0.8468	0.6951	0.4952	0.3384	0.3832	0.6348	0.8849	0.9680	0.9866 (94)
Useful gains	559.3927	652.0158	705.7124	719.3631	631.9860	445.6177	290.9676	305.7645	465.5175	566.3915	549.4275	532.8438 (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	1245.8817	1210.1104	1095.7828	911.3658	694.1286	455.8758	292.3583	308.1992	495.9333	766.6623	1024.4416	1240.3631 (97)
Space heating kWh	510.7478	375.0396	290.2123	138.2420	46.2341	0.0000	0.0000	0.0000	0.0000	149.0014	342.0101	526.3943 (98a)
Space heating requirement - total per year (kWh/year)												2377.8817
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	510.7478	375.0396	290.2123	138.2420	46.2341	0.0000	0.0000	0.0000	0.0000	149.0014	342.0101	526.3943 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2377.8817
Space heating per m2										(98c) / (4) =		36.5884 (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 %)												88.4000 (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	510.7478	375.0396	290.2123	138.2420	46.2341	0.0000	0.0000	0.0000	0.0000	149.0014	342.0101	526.3943 (98)
Space heating efficiency (main heating system 1)	88.4000	88.4000	88.4000	88.4000	88.4000	0.0000	0.0000	0.0000	0.0000	88.4000	88.4000	88.4000 (210)
Space heating fuel (main heating system)	577.7690	424.2529	328.2945	156.3823	52.3010	0.0000	0.0000	0.0000	0.0000	168.5537	386.8893	595.4687 (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	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228 (64)
Efficiency of water heater (217)m	88.3354	88.3271	88.3122	88.2825	88.2393	88.2000	88.2000	88.2000	88.2000	88.2859	88.3231	88.2000 (216)
Fuel for water heating, kWh/month	274.9468	242.7925	256.7411	222.5458	213.6805	190.2570	185.9132	194.5366	198.0694	223.5116	241.1034	271.4853 (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	19.4233	15.5821	14.0299	10.2789	7.9397	6.4868	7.2429	9.4146	12.2286	16.0446	18.1223	19.9631 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-48.1960	-65.3825	-90.2831	-96.2153	-98.7706	-90.4356	-89.2844	-86.6627	-80.9887	-72.4623	-51.9516	-41.8498 (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	-39.9670	-85.7554	-176.0587	-270.8699	-361.4369	-364.2480	-358.4881	-300.4923	-215.4537	-123.3464	-53.4565	-31.3419 (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												2689.9114 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												88.2000
Water heating fuel used												2715.5833 (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)												156.7569 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3293.3975 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2354.8541 (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	2689.9114	0.2100	564.8814 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2715.5833	0.2100	570.2725 (264)
Space and water heating			1135.1539 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	156.7569	0.1443	22.6249 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-912.4827	0.1357	-123.7977
PV Unit electricity exported	-2380.9148	0.1254	-298.4730
Total			-422.2707 (269)
Total CO2, kg/year			747.4373 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.5000 (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	2689.9114	1.1300	3039.5999 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2715.5833	1.1300	3068.6092 (278)
Space and water heating			6108.2091 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	156.7569	1.5338	240.4390 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-912.4827	1.5015	-1370.0763
PV Unit electricity exported	-2380.9148	0.4601	-1095.5572
Total			-2465.6334 (283)
Total Primary energy kWh/year			4013.1154 (286)
Dwelling Primary energy Rate (DPER)			61.7500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	64.9900 (1b)	2.4000 (2b)	155.9760 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	155.9760 (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	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1282 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3782 (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) = 0.3499 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1750 1.1750 (22a)
Adj infilt rate	0.4461 0.4373 0.4286 0.3848 0.3761 0.3324 0.3324 0.3236 0.3499 0.3761 0.3936 0.4111 (22b)
Effective ac	0.5995 0.5956 0.5918 0.5741 0.5707 0.5552 0.5552 0.5524 0.5612 0.5707 0.5775 0.5845 (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							
TER Opaque door			1.9700	1.0000	1.9700		(26)
TER Opening Type			14.2800	1.1450	16.3511		(27)
Heat Loss Floor 1			64.9900	0.1300	8.4487		(28a)
External Wall 1	80.6400	16.2500	64.3900	0.1800	11.5902		(29a)
External Roof 1	64.9900		64.9900	0.1100	7.1489		(30)
Total net area of external elements Aum(A, m2)			210.6200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.5089		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				244.6794 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	16.4200	0.0500	0.8210	
E3 Sill	15.4800	0.0500	0.7740	
E4 Jamb	24.0000	0.0500	1.2000	
E5 Ground floor (normal)	33.6000	0.1600	5.3760	
E16 Corner (normal)	9.6000	0.0900	0.8640	
E10 Eaves (insulation at ceiling level)	21.5200	0.0600	1.2912	
E12 Gable (insulation at ceiling level)	12.0800	0.0600	0.7248	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.0510 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 56.5599 (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	30.8569	30.6581	30.4632	29.5477	29.3764	28.5790	28.5790	28.4314	28.8861	29.3764	29.7229	30.0852 (38)
Average = Sum(39)m / 12 =	87.4169	87.2180	87.0231	86.1076	85.9363	85.1390	85.1390	84.9913	85.4461	85.9363	86.2828	86.6451 (39)
												86.1068
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3451	1.3420	1.3390	1.3249	1.3223	1.3100	1.3100	1.3078	1.3148	1.3223	1.3276	1.3332 (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													2.1187 (42)
Hot water usage for mixer showers	59.7424	58.8446	57.5363	55.0331	53.1859	51.1258	49.9549	51.2532	52.6765	54.8884	57.4453	59.5135 (42a)	
Hot water usage for baths	25.8144	25.4310	24.8912	23.8957	23.1503	22.3238	21.8774	22.4135	22.9972	23.8816	24.8976	25.7272 (42b)	
Hot water usage for other uses	36.3271	35.0061	33.6851	32.3641	31.0432	29.7222	29.7222	31.0432	32.3641	33.6851	35.0061	36.3271 (42c)	
Average daily hot water use (litres/day)												112.0392 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	121.8840	119.2818	116.1126	111.2930	107.3794	103.1718	101.5544	104.7099	108.0379	112.4552	117.3490	121.5678 (44)	
Distribution loss (46)m = 0.15 x (45)m	193.0344	169.8557	178.4608	152.3546	144.5533	126.8618	122.8213	129.6527	133.2215	152.6006	167.1852	190.3458 (45)	
Water storage loss:	28.9552	25.4783	26.7691	22.8532	21.6830	19.0293	18.4232	19.4479	19.9832	22.8901	25.0778	28.5519 (46)	
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	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	243.9933	215.8831	229.4197	201.6696	195.5122	176.1769	173.7802	180.6117	182.5366	203.5595	216.5003	241.3047 (62)	
WWHRS	-27.3117	-24.1547	-25.2934	-20.9440	-19.5190	-16.7026	-15.6560	-16.6486	-17.2811	-20.3725	-23.0796	-26.8060 (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	216.6815	191.7283	204.1262	180.7257	175.9932	159.4743	158.1242	163.9631	165.2555	183.1870	193.4207	214.4987 (64)	
12Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Heat gains from water heating, kWh/month	76.9237	67.9839	72.0779	62.9867	60.8037	54.5103	53.5778	55.8493	56.6249	63.4794	67.9178	76.0297 (65)	
												2207.1783 (64)	
												2207 (64)	
												0.0000 (64a)	
												0.0000 (64a)	

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	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	93.5158	103.5354	93.5158	96.6330	93.5158	96.6330	93.5158	93.5158	96.6330	93.5158	96.6330	93.5158 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	185.3343	187.2575	182.4111	172.0937	159.0699	146.8294	138.6519	136.7287	141.5751	151.8925	164.9163	177.1568 (68)
Pumps, fans	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933 (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)	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460 (71)
Total internal gains	103.3920	101.1664	96.8789	87.4815	81.7254	75.7088	72.0132	75.0662	78.6457	85.3218	94.3303	102.1904 (72)
	440.0219	449.7391	430.5856	413.9880	392.0909	373.9509	358.9607	360.0905	371.6336	388.5099	413.6594	430.6429 (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
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Northeast			3.3300		11.2829		0.6300		0.7000		0.7700		11.4826 (75)
Southeast			2.8100		36.7938		0.6300		0.7000		0.7700		31.5975 (77)
Southwest			5.6100		36.7938		0.6300		0.7000		0.7700		63.0826 (79)
Northwest			2.5300		11.2829		0.6300		0.7000		0.7700		8.7240 (81)

Solar gains	114.8867	202.4063	294.7689	395.1149	469.8365	478.4362	456.2708	398.6910	329.2304	228.5089	138.8300	97.5282 (83)
Total gains	554.9086	652.1454	725.3545	809.1029	861.9274	852.3871	815.2315	758.7815	700.8640	617.0188	552.4895	528.1710 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.5296	50.6448	50.7583	51.2979	51.4002	51.8816	51.8816	51.9717	51.6951	51.4002	51.1938	50.9797	
alpha	4.3686	4.3763	4.3839	4.4199	4.4267	4.4588	4.4588	4.4648	4.4463	4.4267	4.4129	4.3986	
util living area	0.9909	0.9810	0.9605	0.9021	0.7837	0.6049	0.4517	0.5020	0.7397	0.9307	0.9821	0.9926 (86)	
MIT	19.5266	19.7616	20.0839	20.4929	20.7988	20.9523	20.9896	20.9836	20.8842	20.4806	19.9333	19.4888 (87)	
Th 2	19.8057	19.8081	19.8104	19.8214	19.8234	19.8330	19.8330	19.8348	19.8293	19.8234	19.8193	19.8149 (88)	
util rest of house	0.9880	0.9751	0.9478	0.8711	0.7211	0.5084	0.3359	0.3814	0.6487	0.9016	0.9754	0.9902 (89)	
MIT 2	18.1285	18.4270	18.8311	19.3301	19.6636	19.8076	19.8300	19.8295	19.7564	19.3304	18.6551	18.0869 (90)	
Living area fraction									fLA = Living area / (4) =				0.4531 (91)
MIT	18.7620	19.0317	19.3988	19.8571	20.1780	20.3263	20.3554	20.3524	20.2675	19.8516	19.2343	18.7221 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7620	19.0317	19.3988	19.8571	20.1780	20.3263	20.3554	20.3524	20.2675	19.8516	19.2343	18.7221 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9844	0.9700	0.9423	0.8722	0.7414	0.5507	0.3885	0.4361	0.6853	0.9024	0.9710	0.9871 (94)
Useful gains	546.2738	632.5655	683.5266	705.7096	639.0503	469.3894	316.7223	330.9403	480.3137	556.8285	536.4453	521.3772 (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	1264.2268	1232.5427	1122.4939	943.4856	728.5715	487.5327	319.7333	335.9224	526.9866	795.0489	1046.9837	1258.2713 (97)
Space heating kWh	534.1571	403.1847	326.5917	171.1987	66.6038	0.0000	0.0000	0.0000	0.0000	177.2359	367.5876	548.2492 (98a)
Space heating requirement - total per year (kWh/year)												2594.8087
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	534.1571	403.1847	326.5917	171.1987	66.6038	0.0000	0.0000	0.0000	0.0000	177.2359	367.5876	548.2492 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2594.8087
Space heating per m2										(98c) / (4) =		39.9263 (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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	534.1571	403.1847	326.5917	171.1987	66.6038	0.0000	0.0000	0.0000	0.0000	177.2359	367.5876	548.2492 (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)	578.0921	436.3470	353.4542	185.2800	72.0820	0.0000	0.0000	0.0000	0.0000	191.8138	397.8221	593.3433 (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	216.6815	191.7283	204.1262	180.7257	175.9932	159.4743	158.1242	163.9631	165.2555	183.1870	193.4207	214.4987 (64)	
Efficiency of water heater (217)m	86.2347	85.9339	85.3829	84.2655	82.4909	80.3000	80.3000	80.3000	80.3000	84.3107	85.7343	86.3008 (217)	
Fuel for water heating, kWh/month	251.2695	223.1113	239.0717	214.4717	213.3487	198.5981	196.9168	204.1881	205.7976	217.2761	225.6048	248.5478 (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	19.4307	15.5881	14.0353	10.2829	7.9428	6.4893	7.2457	9.4182	12.2333	16.0508	18.1293	19.9708 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-50.7855	-67.0485	-90.3649	-95.1271	-97.5149	-89.3402	-88.2545	-85.7059	-80.5979	-73.4636	-54.2011	-44.4658 (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)	-44.3727	-90.9451	-176.5094	-259.2003	-337.2257	-336.8208	-332.8085	-284.2030	-211.6352	-127.9193	-58.5147	-35.2692 (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													2808.2345 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)

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Efficiency of water heater	80.3000	
Water heating fuel used	2638.2021	(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)	156.8172	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3212.2936	(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	2476.9602	(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	2808.2345	0.2100	589.7292 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2638.2021	0.2100	554.0224 (264)
Space and water heating			1143.7517 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	156.8172	0.1443	22.6336 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-916.8697	0.1360	-124.6792
PV Unit electricity exported	-2295.4239	0.1266	-290.5475
Total			-415.2267 (269)
Total CO2, kg/year			763.0878 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7400 (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	2808.2345	1.1300	3173.3050 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2638.2021	1.1300	2981.1684 (278)
Space and water heating			6154.4733 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	156.8172	1.5338	240.5315 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-916.8697	1.5026	-1377.7322
PV Unit electricity exported	-2295.4239	0.4647	-1066.5794
Total			-2444.3115 (283)
Total Primary energy kWh/year			4080.7941 (286)
Target Primary Energy Rate (TPER)			62.7900 (287)

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

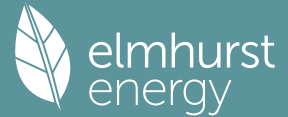
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	64.9900	2.4000	155.9760
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.9900		155.9760
Dwelling volume			155.9760

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	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1282 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.3787 (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) = 0.3503 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4467	0.4379	0.4291	0.3854	0.3766	0.3328	0.3328	0.3240	0.3503	0.3766	0.3941	0.4116 (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	0.5998	0.5959	0.5921	0.5742	0.5709	0.5554	0.5554	0.5525	0.5614	0.5709	0.5777	0.5847 (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							
Entrance door			1.9700	1.2000	2.3640		(26)
Glazed door			3.8000	1.3258	5.0379		(27)
Window			11.9300	1.1450	13.6603		(27)
Heat Loss Floor 1			64.9900	0.1200	7.7988	65.5200	4258.1448 (28a)
External Wall 1	80.6400	17.7000	62.9400	0.1700	10.6998	55.6400	3501.9816 (29a)
External Roof 1	64.9900		64.9900	0.1043	6.7762	12.1700	790.9283 (30)
Total net area of external elements Aum(A, m2)			210.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.3370		(33)
Main dwelling							
Internal Wall 1			96.8400			75.0000	7263.0000 (32c)
Internal Wall 2			9.7400			9.0000	87.6600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15901.7147 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							244.6794 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.4200	0.1750	2.8735	
E3 Sill				15.4800	0.0230	0.3560	
E4 Jamb				24.0000	0.0180	0.4320	
E5 Ground floor (normal)				33.6000	0.0530	1.7808	
E16 Corner (normal)				9.6000	0.0400	0.3840	
E10 Eaves (insulation at ceiling level)				21.5200	0.0550	1.1836	
E12 Gable (insulation at ceiling level)				12.0800	0.0370	0.4470	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4569 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	53.7939 (37)

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

(38)m	Jan 30.8705	Feb 30.6711	Mar 30.4757	Apr 29.5578	May 29.3860	Jun 28.5865	Jul 28.5865	Aug 28.4385	Sep 28.8945	Oct 29.3860	Nov 29.7334	Dec 30.0967 (38)
Heat transfer coeff	84.6644	84.4650	84.2696	83.3516	83.1799	82.3804	82.3804	82.2324	82.6884	83.1799	83.5273	83.8906 (39)
Average = Sum(39)m / 12 =												83.3508

HLP	Jan 1.3027	Feb 1.2997	Mar 1.2967	Apr 1.2825	May 1.2799	Jun 1.2676	Jul 1.2676	Aug 1.2653	Sep 1.2723	Oct 1.2799	Nov 1.2852	Dec 1.2908 (40)
HLP (average)												1.2825
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1187 (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	25.8144	25.4310	24.8912	23.8957	23.1503	22.3238	21.8774	22.4135	22.9972	23.8816	24.8976	25.7272 (42b)
Hot water usage for other uses	36.3271	35.0061	33.6851	32.3641	31.0432	29.7222	29.7222	31.0432	32.3641	33.6851	35.0061	36.3271 (42c)
Average daily hot water use (litres/day)												56.9587 (43)
Daily hot water use	Jan 62.1415	Feb 60.4372	Mar 58.5763	Apr 56.2599	May 54.1935	Jun 52.0460	Jul 51.5996	Aug 53.4567	Sep 55.3614	Oct 57.5668	Nov 59.9037	Dec 62.0543 (44)
Energy conte	98.4170	86.0617	90.0296	77.0169	72.9549	63.9967	62.4052	66.1905	68.2661	78.1175	85.3438	97.1620 (45)
Energy content (annual)										Total = Sum(45)m =		945.9619
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	83.6544	73.1525	76.5251	65.4644	62.0116	54.3972	53.0444	56.2620	58.0262	66.3999	72.5422	82.5877 (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	83.6544	73.1525	76.5251	65.4644	62.0116	54.3972	53.0444	56.2620	58.0262	66.3999	72.5422	82.5877 (64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			804.0676 (64)
Electric shower(s)	47.8437	42.6292	46.5494	44.4215	45.2551	43.1690	44.6079	45.2551	44.4215	46.5494	45.6741	47.8437 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												544.2196 (64a)
Heat gains from water heating, kWh/month	32.8745	28.9454	30.7686	27.4715	26.8167	24.3915	24.4131	25.3793	25.6119	28.2373	29.5541	32.6079 (65)

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

Metabolic gains (Table 5), Watts	Jan 105.9326	Feb 105.9326	Mar 105.9326	Apr 105.9326	May 105.9326	Jun 105.9326	Jul 105.9326	Aug 105.9326	Sep 105.9326	Oct 105.9326	Nov 105.9326	Dec 105.9326 (66)
(66)m												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.4799	103.4956	93.4799	96.5959	93.4799	96.5959	93.4799	93.4799	96.5959	93.4799	96.5959	93.4799 (67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3343	187.2575	182.4111	172.0937	159.0699	146.8294	138.6519	136.7287	141.5751	151.8925	164.9163	177.1568 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933 (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)	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460 (71)
Water heating gains (Table 5)	44.1862	43.0735	41.3557	38.1548	36.0439	33.8771	32.8133	34.1119	35.5721	37.9534	41.0473	43.8278 (72)
Total internal gains	377.7801	388.6063	372.0264	361.6242	343.3735	332.0821	319.7248	319.1003	328.5229	338.1055	357.3392	369.2442 (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
Southwest			3.8000		36.7938		0.6300		0.7000		0.7700		42.7298 (79)
Northeast			3.6700		11.2829		0.6300		0.7000		0.7700		12.6549 (75)
Southeast			3.0900		36.7938		0.6300		0.7000		0.7700		34.7460 (77)
Southwest			2.3800		36.7938		0.6300		0.7000		0.7700		26.7623 (79)
Northwest			2.7900		11.2829		0.6300		0.7000		0.7700		9.6205 (81)
Solar gains	126.5136	222.8984	324.6325	435.1769	517.5020	526.9854	502.5662	439.1261	362.5962	251.6492	152.8815	107.3974	(83)
Total gains	504.2937	611.5047	696.6589	796.8011	860.8754	859.0675	822.2911	758.2263	691.1190	589.7547	510.2208	476.6416	(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	52.1724	52.2955	52.4168	52.9941	53.1035	53.6188	53.6188	53.7154	53.4192	53.1035	52.8826	52.6536
alpha	4.4782	4.4864	4.4945	4.5329	4.5402	4.5746	4.5746	4.5810	4.5613	4.5402	4.5255	4.5102
util living area	0.9936	0.9846	0.9640	0.9010	0.7731	0.5865	0.4349	0.4883	0.7339	0.9365	0.9863	0.9950 (86)
MIT	19.5107	19.7629	20.1011	20.5241	20.8231	20.9616	20.9921	20.9869	20.8961	20.4876	19.9234	19.4711 (87)
Th 2	19.8387	19.8411	19.8435	19.8545	19.8566	19.8663	19.8663	19.8681	19.8626	19.8566	19.8524	19.8480 (88)
util rest of house	0.9915	0.9796	0.9523	0.8703	0.7108	0.4938	0.3259	0.3735	0.6445	0.9096	0.9810	0.9934 (89)
MIT 2	18.5081	18.7589	19.0905	19.4949	19.7476	19.8505	19.8645	19.8648	19.8116	19.4741	18.9283	18.4759 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9625	19.2139	19.5485	19.9612	20.2349	20.3540	20.3755	20.3732	20.3031	19.9334	19.3792	18.9269 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9625	19.2139	19.5485	19.9612	20.2349	20.3540	20.3755	20.3732	20.3031	19.9334	19.3792	18.9269 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9894	0.9762	0.9487	0.8735	0.7329	0.5349	0.3755	0.4257	0.6815	0.9118	0.9782	0.9916 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1241.3875	1209.0210	1099.5875	921.9730	709.9349	474.0165	311.0242	326.7293	512.9208	776.3475	1025.6515	1235.4439 (97)
Space heating kWh	552.3701	411.3035	326.3646	162.6941	58.8070	0.0000	0.0000	0.0000	0.0000	177.5398	379.1122	567.5328 (98a)
Space heating requirement - total per year (kWh/year)	2635.7242											
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	552.3701	411.3035	326.3646	162.6941	58.8070	0.0000	0.0000	0.0000	0.0000	177.5398	379.1122	567.5328 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2635.7242											
Space heating per m2	(98c) / (4) = 40.5558 (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	774.3760	609.6152	624.9660	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8992	0.9445	0.9225	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	696.2929	575.7943	576.5571	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	969.3651	928.2129	855.1402	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	196.6120	262.1994	207.2658	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
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	49.1530	65.5499	51.8165	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	166.5193 (107)											
Energy for space heating	40.5558 (99)											
Energy for space cooling	2.5622 (108)											
Total	43.1181 (109)											
Fabric Energy Efficiency (DFEE)	43.1 (109)											

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	64.9900 (1b)	x 2.4000 (2b)	= 155.9760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.9760 (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	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	20.0000 / (5) =	0.1282 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	5.0000 (17)
Infiltration rate		0.3782 (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) =	0.3499 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.4461	0.4373	0.4286	0.3848	0.3761	0.3324	0.3324	0.3236	0.3499	0.3761	0.3936	0.4111 (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	0.5995	0.5956	0.5918	0.5741	0.5707	0.5552	0.5552	0.5524	0.5612	0.5707	0.5775	0.5845 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opaque door			1.9700	1.0000	1.9700		(26)
TER Opening Type			14.2800	1.1450	16.3511		(27)
Heat Loss Floor 1			64.9900	0.1300	8.4487		(28a)
External Wall 1	80.6400	16.2500	64.3900	0.1800	11.5902		(29a)
External Roof 1	64.9900		64.9900	0.1100	7.1489		(30)
Total net area of external elements Aum(A, m ²)			210.6200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.5089	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.6794 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.4200	0.0500	0.8210	
E3 Sill				15.4800	0.0500	0.7740	
E4 Jamb				24.0000	0.0500	1.2000	
E5 Ground floor (normal)				33.6000	0.1600	5.3760	
E16 Corner (normal)				9.6000	0.0900	0.8640	
E10 Eaves (insulation at ceiling level)				21.5200	0.0600	1.2912	
E12 Gable (insulation at ceiling level)				12.0800	0.0600	0.7248	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.0510 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	56.5599 (37)

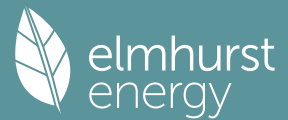
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.8569	30.6581	30.4632	29.5477	29.3764	28.5790	28.5790	28.4314	28.8861	29.3764	29.7229	30.0852 (38)
Average = Sum(39)m / 12 =	87.4169	87.2180	87.0231	86.1076	85.9363	85.1390	85.1390	84.9913	85.4461	85.9363	86.2828	86.6451 (39)
												86.1068
HLP	1.3451	1.3420	1.3390	1.3249	1.3223	1.3100	1.3100	1.3078	1.3148	1.3223	1.3276	1.3332 (40)
HLP (average)												1.3249
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1187 (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	25.8144	25.4310	24.8912	23.8957	23.1503	22.3238	21.8774	22.4135	22.9972	23.8816	24.8976	25.7272 (42b)
Hot water usage for other uses	36.3271	35.0061	33.6851	32.3641	31.0432	29.7222	29.7222	31.0432	32.3641	33.6851	35.0061	36.3271 (42c)
Average daily hot water use (litres/day)												56.9587 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Daily hot water use	62.1415	60.4372	58.5763	56.2599	54.1935	52.0460	51.5996	53.4567	55.3614	57.5668	59.9037	62.0543 (44)
Energy content (annual)	98.4170	86.0617	90.0296	77.0169	72.9549	63.9967	62.4052	66.1905	68.2661	78.1175	85.3438	97.1620 (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	83.6544	73.1525	76.5251	65.4644	62.0116	54.3972	53.0444	56.2620	58.0262	66.3999	72.5422	82.5877 (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	83.6544	73.1525	76.5251	65.4644	62.0116	54.3972	53.0444	56.2620	58.0262	66.3999	72.5422	82.5877 (64)
12Total per year (kWh/year)												804.0676 (64)
Electric shower(s)	47.8437	42.6292	46.5494	44.4215	45.2551	43.1690	44.6079	45.2551	44.4215	46.5494	45.6741	47.8437 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												544.2196 (64a)
Heat gains from water heating, kWh/month	32.8745	28.9454	30.7686	27.4715	26.8167	24.3915	24.4131	25.3793	25.6119	28.2373	29.5541	32.6079 (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	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	105.9326	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.5158	103.5354	93.5158	96.6330	93.5158	96.6330	93.5158	93.5158	96.6330	93.5158	96.6330	93.5158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3343	187.2575	182.4111	172.0937	159.0699	146.8294	138.6519	136.7287	141.5751	151.8925	164.9163	177.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	33.5933	(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)	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	(71)
Water heating gains (Table 5)	44.1862	43.0735	41.3557	38.1548	36.0439	33.8771	32.8133	34.1119	35.5721	37.9534	41.0473	43.8278	(72)
Total internal gains	377.8161	388.6461	372.0624	361.6614	343.4094	332.1193	319.7608	319.1362	328.5600	338.1415	357.3764	369.2802	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				3.3300	11.2829		0.6300	0.7000		0.7700		11.4826 (75)
Southeast				2.8100	36.7938		0.6300	0.7000		0.7700		31.5975 (77)
Southwest				5.6100	36.7938		0.6300	0.7000		0.7700		63.0826 (79)
Northwest				2.5300	11.2829		0.6300	0.7000		0.7700		8.7240 (81)
Solar gains	114.8867	202.4063	294.7689	395.1149	469.8365	478.4362	456.2708	398.6910	329.2304	228.5089	138.8300	97.5282 (83)
Total gains	492.7028	591.0524	666.8313	756.7763	813.2460	810.5555	776.0317	717.8272	657.7904	566.6504	496.2064	466.8083 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.5296	50.6448	50.7583	51.2979	51.4002	51.8816	51.8816	51.9717	51.6951	51.4002	51.1938	50.9797	
alpha	4.3686	4.3763	4.3839	4.4199	4.4267	4.4588	4.4588	4.4648	4.4463	4.4267	4.4129	4.3986	
util living area	0.9942	0.9867	0.9703	0.9191	0.8086	0.6299	0.4728	0.5276	0.7691	0.9468	0.9880	0.9954	(86)
MIT	19.4294	19.6700	20.0034	20.4372	20.7697	20.9441	20.9875	20.9800	20.8638	20.4192	19.8483	19.3921	(87)
Th 2	19.8057	19.8081	19.8104	19.8214	19.8234	19.8330	19.8330	19.8348	19.8293	19.8234	19.8193	19.8149	(88)
util rest of house	0.9923	0.9824	0.9603	0.8920	0.7486	0.5318	0.3524	0.4023	0.6802	0.9230	0.9833	0.9939	(89)
MIT 2	18.4026	18.6423	18.9708	19.3901	19.6783	19.8094	19.8301	19.8296	19.7608	19.3851	18.8292	18.3724	(90)
Living area fraction									fLA = Living area / (4) =			0.4531	(91)
MIT	18.8679	19.1080	19.4387	19.8646	20.1729	20.3236	20.3546	20.3509	20.2606	19.8537	19.2910	18.8345	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8679	19.1080	19.4387	19.8646	20.1729	20.3236	20.3546	20.3509	20.2606	19.8537	19.2910	18.8345	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9903	0.9791	0.9564	0.8931	0.7680	0.5747	0.4072	0.4593	0.7158	0.9238	0.9805	0.9922	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1273.4815	1239.1932	1125.9676	944.1335	728.1259	487.2994	319.6612	335.7949	526.3995	795.2302	1051.8740	1268.0061	(97)
Space heating kWh	584.4696	443.8428	363.2399	193.1335	77.0367	0.0000	0.0000	0.0000	0.0000	202.2084	407.0535	598.8099	(98a)
Space heating requirement - total per year (kWh/year)												2869.7942	
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													

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584.4696 443.8428 363.2399 193.1335 77.0367 0.0000 0.0000 0.0000 0.0000 202.2084 407.0535 598.8099 (98c)
Space heating requirement after solar contribution - total per year (kWh/year) 2869.7942
Space heating per m2 (98c) / (4) = 44.1575 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	800.3062	630.0283	645.9338	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8661	0.9221	0.8954	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	693.1395	580.9566	578.3407	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh												
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	158.0278	218.1023	170.7793	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	39.5069	54.5256	42.6948	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												136.7273 (107)
Energy for space cooling												44.1575 (99)
Total												2.1038 (108)
Fabric Energy Efficiency (TFEE)												46.2613 (109)
												46.3 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	64.9900 (1b)	x 2.4000 (2b)	= 155.9760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	155.9760 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

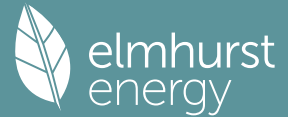
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1282 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0100	(17)
Infiltration rate	0.3787	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3503 (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	0.4467	0.4379	0.4291	0.3854	0.3766	0.3328	0.3328	0.3240	0.3503	0.3766	0.3941	0.4116 (22b)
Effective ac	0.5998	0.5959	0.5921	0.5742	0.5709	0.5554	0.5554	0.5525	0.5614	0.5709	0.5777	0.5847 (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							
Entrance door			1.9700	1.2000	2.3640		(26)
Glazed door			3.8000	1.3258	5.0379		(27)
Window			11.9300	1.1450	13.6603		(27)
Heat Loss Floor 1			64.9900	0.1200	7.7988	65.5200	4258.1448 (28a)
External Wall 1	80.6400	17.7000	62.9400	0.1700	10.6998	55.6400	3501.9816 (29a)
External Roof 1	64.9900		64.9900	0.1043	6.7762	12.1700	790.9283 (30)
Total net area of external elements Aum(A, m2)			210.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.3370		(33)
Main dwelling							
Internal Wall 1			96.8400			75.0000	7263.0000 (32c)
Internal Wall 2			9.7400			9.0000	87.6600 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 15901.7147 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							244.6794 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	16.4200	0.1750	2.8735
E3 Sill	15.4800	0.0230	0.3560
E4 Jamb	24.0000	0.0180	0.4320
E5 Ground floor (normal)	33.6000	0.0530	1.7808
E16 Corner (normal)	9.6000	0.0400	0.3840
E10 Eaves (insulation at ceiling level)	21.5200	0.0550	1.1836
E12 Gable (insulation at ceiling level)	12.0800	0.0370	0.4470
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.4569 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	53.7939 (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	30.8705	30.6711	30.4757	29.5578	29.3860	28.5865	28.5865	28.4385	28.8945	29.3860	29.7334	30.0967 (38)
Heat transfer coeff	84.6644	84.4650	84.2696	83.3516	83.1799	82.3804	82.3804	82.2324	82.6884	83.1799	83.5273	83.8906 (39)
Average = Sum(39)m / 12 =												83.3508

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3027	1.2997	1.2967	1.2825	1.2799	1.2676	1.2676	1.2653	1.2723	1.2799	1.2852	1.2908 (40)
HLP (average)												1.2825
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1187 (42)
Hot water usage for mixer showers	74.6780	73.5558	71.9204	68.7914	66.4823	63.9072	62.4436	64.0665	65.8456	68.6105	71.8067	74.3919 (42a)
Hot water usage for baths	25.8144	25.4310	24.8912	23.8957	23.1503	22.3238	21.8774	22.4135	22.9972	23.8816	24.8976	25.7272 (42b)
Hot water usage for other uses	36.3271	35.0061	33.6851	32.3641	31.0432	29.7222	29.7222	31.0432	32.3641	33.6851	35.0061	36.3271 (42c)
Average daily hot water use (litres/day)												125.8093 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	136.8196	133.9929	130.4967	125.0513	120.6758	115.9533	114.0432	117.5232	121.2070	126.1773	131.7104	136.4462 (44)
Energy content (annual)	216.6887	190.8041	200.5686	171.1890	162.4529	142.5781	137.9253	145.5183	149.4604	171.2213	187.6456	213.6417 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 2089.6940											
	32.5033	28.6206	30.0853	25.6783	24.3679	21.3867	20.6888	21.8277	22.4191	25.6832	28.1468	32.0463 (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	26.1868	23.6475	26.1651	25.2800	26.0973	25.2286	26.0501	26.0630	25.2369	26.1080	25.3046	26.1811 (61)
Total heat required for water heating calculated for each month	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228 (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	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228 (64)
	Total per year (kWh/year) = Sum(64)m = 2397.2429 (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	78.5957	69.3542	73.2303	63.2403	60.5399	53.7144	52.3727	54.9006	56.0048	63.4581	68.7183	77.5811 (65)

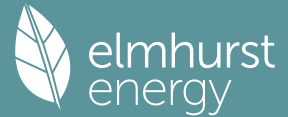
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	22.1906	19.7095	16.0288	12.1348	9.0709	7.6581	8.2748	10.7559	14.4366	18.3305	21.3944	22.8073 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	276.6183	279.4888	272.2554	256.8563	237.4178	219.1483	206.9432	204.0727	211.3061	226.7052	246.1437	264.4132 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306 (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)												
	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460 (71)
Water heating gains (Table 5)												
	105.6394	103.2057	98.4278	87.8338	81.3708	74.6033	70.3934	73.7911	77.7844	85.2931	95.4421	104.2757 (72)
Total internal gains												
	499.6518	497.6075	481.9156	452.0285	423.0631	393.6132	377.8150	380.8233	395.7307	425.5324	458.1838	486.6998 (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
Southwest	3.8000	36.7938	0.6300	0.7000	0.7700	42.7298 (79)
Northeast	3.6700	11.2829	0.6300	0.7000	0.7700	12.6549 (75)
Southeast	3.0900	36.7938	0.6300	0.7000	0.7700	34.7460 (77)
Southwest	2.3800	36.7938	0.6300	0.7000	0.7700	26.7623 (79)
Northwest	2.7900	11.2829	0.6300	0.7000	0.7700	9.6205 (81)
Solar gains	126.5136	222.8984	324.6325	435.1769	517.5020	526.9854
Total gains	626.1654	720.5060	806.5481	887.2055	940.5651	920.5986
						502.5662
						439.1261
						362.5962
						251.6492
						152.8815
						107.3974 (83)
						594.0972 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.1724	52.2955	52.4168	52.9941	53.1035	53.6188	53.6188	53.7154	53.4192	53.1035	52.8826	52.6536	
alpha	4.4782	4.4864	4.4945	4.5329	4.5402	4.5746	4.5746	4.5810	4.5613	4.5402	4.5255	4.5102	
util living area	0.9853	0.9719	0.9415	0.8675	0.7316	0.5527	0.4075	0.4541	0.6883	0.9038	0.9733	0.9881 (86)	
MIT	19.9558	20.1235	20.3646	20.6384	20.8268	20.9097	20.9278	20.9251	20.8724	20.6209	20.2365	19.9231 (87)	
Th 2	19.8387	19.8411	19.8435	19.8545	19.8566	19.8663	19.8663	19.8681	19.8626	19.8566	19.8524	19.8480 (88)	
util rest of house	0.9808	0.9636	0.9243	0.8308	0.6668	0.4632	0.3047	0.3460	0.5980	0.8679	0.9638	0.9845 (89)	
MIT 2	18.6487	18.8608	19.1595	19.4897	19.6883	19.7677	19.7782	19.7791	19.7392	19.4818	19.0146	18.6147 (90)	
Living area fraction									fLA = Living area / (4) =				0.4531 (91)
MIT	19.2410	19.4330	19.7056	20.0102	20.2042	20.2852	20.2992	20.2984	20.2527	19.9980	19.5683	19.2076 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.0910	19.2830	19.5556	19.8602	20.0542	20.1352	20.1492	20.1484	20.1027	19.8480	19.4183	19.0576 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9770	0.9586	0.9192	0.8310	0.6788	0.4851	0.3307	0.3733	0.6184	0.8675	0.9593	0.9812 (94)
Useful gains	611.7932	690.6731	741.3847	737.3047	638.4275	446.5540	291.1171	306.0559	468.9503	587.4789	586.1909	582.9126 (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	1252.2731	1214.8571	1100.1869	913.5528	694.9030	455.9934	292.3808	308.2413	496.3556	769.2484	1028.9175	1246.4128 (97)
Space heating kWh	476.5170	352.2516	266.9489	126.8987	42.0178	0.0000	0.0000	0.0000	0.0000	135.2365	318.7632	493.6441 (98a)
Space heating requirement - total per year (kWh/year)												2212.2778
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	476.5170	352.2516	266.9489	126.8987	42.0178	0.0000	0.0000	0.0000	0.0000	135.2365	318.7632	493.6441 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2212.2778
Space heating per m2										(98c) / (4) =		34.0403 (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 %)													88.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	476.5170	352.2516	266.9489	126.8987	42.0178	0.0000	0.0000	0.0000	0.0000	135.2365	318.7632	493.6441	(98)
Space heating efficiency (main heating system 1)	88.4000	88.4000	88.4000	88.4000	88.4000	0.0000	0.0000	0.0000	0.0000	88.4000	88.4000	88.4000	(210)
Space heating fuel (main heating system)	539.0464	398.4747	301.9784	143.5505	47.5314	0.0000	0.0000	0.0000	0.0000	152.9825	360.5918	558.4210	(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	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228	(64)
Efficiency of water heater	88.3324	88.3242	88.3080	88.2784	88.2364	88.2000	88.2000	88.2000	88.2000	88.2812	88.3198	88.2000	(216)
Fuel for water heating, kWh/month	274.9564	242.8005	256.7531	222.5562	213.6876	190.2570	185.9132	194.5366	198.0694	223.5236	241.1126	271.4939	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	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	19.4233	15.5821	14.0299	10.2789	7.9397	6.4868	7.2429	9.4146	12.2286	16.0446	18.1223	19.9631	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-48.1960	-65.3825	-90.2831	-96.2153	-98.7706	-90.4356	-89.2844	-86.6627	-80.9887	-72.4623	-51.9516	-41.8498	(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)	-39.9670	-85.7554	-176.0587	-270.8699	-361.4369	-364.2480	-358.4881	-300.4923	-215.4537	-123.3464	-53.4565	-31.3419	(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												2502.5767	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												2715.6601	(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)												156.7569	(232)

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

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PV generation	-3293.3975 (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	2167.5962 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2502.5767	3.6400	91.0938 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2715.6601	3.6400	98.8500 (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	156.7569	16.4900	25.8492 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-912.4827	16.4900	-150.4684
PV Unit electricity exported	-2380.9148	5.5900	-133.0931
Total			-283.5615 (252)
Total energy cost			38.4129 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.1257 (257)
SAP value		97.9620
SAP rating (Section 12)		98 (258)
SAP band		A

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	2502.5767	0.2100	525.5411 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2715.6601	0.2100	570.2886 (264)
Space and water heating			1095.8297 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	156.7569	0.1443	22.6249 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-912.4827	0.1357	-123.7977
PV Unit electricity exported	-2380.9148	0.1254	-298.4730
Total			-422.2707 (269)
Total CO2, kg/year			708.1131 (272)
CO2 emissions per m2			10.9000 (273)
EI value			91.3731
EI rating			91 (274)
EI band			B

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

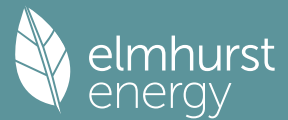
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	64.9900 (1b)	x 2.4000 (2b)	= 155.9760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 155.9760 (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	2 * 10 = 20.0000 (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)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1282 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)

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Infiltration rate													0.3787 (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) = 0.3503 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
Effective ac	0.3854	0.3591	0.3591	0.3416	0.3416	0.2978	0.2978	0.2890	0.2978	0.3328	0.3240	0.3503	(22b)
	0.5742	0.5645	0.5645	0.5583	0.5583	0.5443	0.5443	0.5418	0.5443	0.5554	0.5525	0.5614	(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								
Entrance door			1.9700	1.2000	2.3640			(26)
Glazed door			3.8000	1.3258	5.0379			(27)
Window			11.9300	1.1450	13.6603			(27)
Heat Loss Floor 1			64.9900	0.1200	7.7988	65.5200	4258.1448	(28a)
External Wall 1	80.6400	17.7000	62.9400	0.1700	10.6998	55.6400	3501.9816	(29a)
External Roof 1	64.9900		64.9900	0.1043	6.7762	12.1700	790.9283	(30)
Total net area of external elements Aum(A, m2)			210.6200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 46.3370			(33)
Main dwelling								
Internal Wall 1			96.8400			75.0000	7263.0000	(32c)
Internal Wall 2			9.7400			9.0000	87.6600	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 15901.7147 (34)
244.6794 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	16.4200	0.1750	2.8735	
E3 Sill	15.4800	0.0230	0.3560	
E4 Jamb	24.0000	0.0180	0.4320	
E5 Ground floor (normal)	33.6000	0.0530	1.7808	
E16 Corner (normal)	9.6000	0.0400	0.3840	
E10 Eaves (insulation at ceiling level)	21.5200	0.0550	1.1836	
E12 Gable (insulation at ceiling level)	12.0800	0.0370	0.4470	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.4569 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 53.7939 (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	
	29.5578	29.0544	29.0544	28.7385	28.7385	28.0180	28.0180	27.8858	28.0180	28.5865	28.4385	28.8945	(38)
Heat transfer coeff	83.3516	82.8483	82.8483	82.5324	82.5324	81.8119	81.8119	81.6796	81.8119	82.3804	82.2324	82.6884	(39)
Average = Sum(39)m / 12 =													82.3775
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.2825	1.2748	1.2748	1.2699	1.2699	1.2588	1.2588	1.2568	1.2588	1.2676	1.2653	1.2723	(40)
HLP (average)													1.2675
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

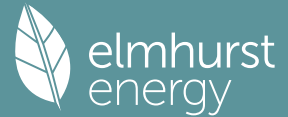
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1187 (42)
Hot water usage for mixer showers													
	74.6780	73.5558	71.9204	68.7914	66.4823	63.9072	62.4436	64.0665	65.8456	68.6105	71.8067	74.3919	(42a)
Hot water usage for baths													
	25.8144	25.4310	24.8912	23.8957	23.1503	22.3238	21.8774	22.4135	22.9972	23.8816	24.8976	25.7272	(42b)
Hot water usage for other uses													
	36.3271	35.0061	33.6851	32.3641	31.0432	29.7222	29.7222	31.0432	32.3641	33.6851	35.0061	36.3271	(42c)
Average daily hot water use (litres/day)													125.8093 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	136.8196	133.9929	130.4967	125.0513	120.6758	115.9533	114.0432	117.5232	121.2070	126.1773	131.7104	136.4462	(44)
Energy conte	216.6887	190.8041	200.5686	171.1890	162.4529	142.5781	137.9253	145.5183	149.4604	171.2213	187.6456	213.6417	(45)
Energy content (annual)													Total = Sum(45)m = 2089.6940
Distribution loss (46)m = 0.15 x (45)m													
	32.5033	28.6206	30.0853	25.6783	24.3679	21.3867	20.6888	21.8277	22.4191	25.6832	28.1468	32.0463	(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	26.1868	23.6475	26.1651	25.2800	26.0973	25.2286	26.0501	26.0630	25.2369	26.1080	25.3046	26.1811	(61)
Total heat required for water heating calculated for each month													
	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228	(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													
	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228	(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													
	78.5957	69.3542	73.2303	63.2403	60.5399	53.7144	52.3727	54.9006	56.0048	63.4581	68.7183	77.5811	(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	
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(66)m	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1906	19.7095	16.0288	12.1348	9.0709	7.6581	8.2748	10.7559	14.4366	18.3305	21.3944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.6183	279.4888	272.2554	256.8563	237.4178	219.1483	206.9432	204.0727	211.3061	226.7052	246.1437	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	(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)	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	(71)
Water heating gains (Table 5)	105.6394	103.2057	98.4278	87.8338	81.3708	74.6033	70.3934	73.7911	77.7844	85.2931	95.4421	(72)
Total internal gains	499.6518	497.6075	481.9156	452.0285	423.0631	393.6132	377.8150	380.8233	395.7307	425.5324	458.1838	(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		
Southwest				3.8000	42.9509	0.6300	0.7000	0.7700	49.8802 (79)		
Northeast				3.6700	13.7758	0.6300	0.7000	0.7700	15.4509 (75)		
Southeast				3.0900	42.9509	0.6300	0.7000	0.7700	40.5605 (77)		
Southwest				2.3800	42.9509	0.6300	0.7000	0.7700	31.2407 (79)		
Northwest				2.7900	13.7758	0.6300	0.7000	0.7700	11.7460 (81)		
Solar gains	148.8783	229.7265	333.8766	457.5575	532.6496	574.7289	542.3157	398.6349	278.8346	177.3223	127.0592 (83)
Total gains	648.5302	727.3341	815.7922	909.5860	955.7127	968.3421	920.1306	862.2024	794.3656	704.3670	613.7590 (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	52.9941	53.3161	53.3161	53.5201	53.5201	53.9914	53.9914	54.0789	53.9914	53.6188	53.7154	53.4192
alpha	4.5329	4.5544	4.5544	4.5680	4.5680	4.5994	4.5994	4.6053	4.5994	4.5746	4.5810	4.5613
util living area	0.9805	0.9660	0.9256	0.8305	0.6642	0.4494	0.3014	0.3395	0.6066	0.8646	0.9624	0.9840 (86)
MIT	20.0646	20.2169	20.4649	20.7142	20.8704	20.9246	20.9318	20.9311	20.9015	20.7085	20.3487	20.0373 (87)
Th 2	19.8545	19.8606	19.8606	19.8645	19.8645	19.8732	19.8732	19.8748	19.8732	19.8663	19.8681	19.8626 (88)
util rest of house	0.9745	0.9558	0.9038	0.7857	0.5904	0.3589	0.2020	0.2342	0.5095	0.8165	0.9491	0.9790 (89)
MIT 2	18.7986	18.9930	19.2948	19.5813	19.7349	19.7836	19.7867	19.7883	19.7706	19.5863	19.1661	18.7708 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.3723	19.5476	19.8250	20.0947	20.2495	20.3007	20.3056	20.3062	20.2831	20.0948	19.7020	19.3447 (92)
Temperature adjustment	-0.1500											
adjusted MIT	19.2223	19.3976	19.6750	19.9447	20.0995	20.1507	20.1556	20.1562	20.1331	19.9448	19.5520	19.1947 (93)

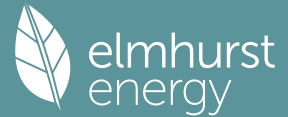
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9702	0.9507	0.8996	0.7892	0.6065	0.3815	0.2270	0.2607	0.5330	0.8204	0.9445	0.9752 (94)
Useful gains	629.2330	691.4717	733.9271	717.8506	579.6283	369.4614	208.9015	224.7798	423.3583	577.8316	600.2073	598.5124 (95)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W	1193.7879	1151.3921	1025.2497	845.5180	610.6947	372.2981	209.0787	225.1230	436.3079	703.9231	966.3967	1182.0081 (97)
Space heating kWh	420.0289	309.0665	216.7441	91.9206	23.1134	0.0000	0.0000	0.0000	0.0000	93.8121	263.6564	434.1208 (98a)
Space heating requirement - total per year (kWh/year)	1852.4626											
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	420.0289	309.0665	216.7441	91.9206	23.1134	0.0000	0.0000	0.0000	0.0000	93.8121	263.6564	434.1208 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1852.4626											
Space heating per m2	(98c) / (4) = 28.5038 (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 %)	88.4000 (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	420.0289	309.0665	216.7441	91.9206	23.1134	0.0000	0.0000	0.0000	0.0000	93.8121	263.6564	434.1208 (98)
Space heating efficiency (main heating system 1)	88.4000	88.4000	88.4000	88.4000	88.4000	0.0000	0.0000	0.0000	0.0000	88.4000	88.4000	88.4000 (210)
Space heating fuel (main heating system)	475.1458	349.6227	245.1856	103.9826	26.1463	0.0000	0.0000	0.0000	0.0000	106.1223	298.2538	491.0868 (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	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228 (64)
Efficiency of water heater	88.2000 (216)											
(217)m	88.3266	88.3180	88.2976	88.2636	88.2218	88.2000	88.2000	88.2000	88.2000	88.2643	88.3105	88.3287 (217)
Fuel for water heating, kWh/month												

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	274.9743	242.8177	256.7834	222.5933	213.7229	190.2570	185.9132	194.5366	198.0694	223.5663	241.1379	271.5117	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	19.4233	15.5821	14.0299	10.2789	7.9397	6.4868	7.2429	9.4146	12.2286	16.0446	18.1223	19.9631	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-54.5476	-67.2173	-91.9682	-97.9019	-99.3991	-91.6688	-90.3861	-88.4832	-83.7658	-76.7163	-57.6874	-47.7532	(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	-51.3191	-91.4887	-185.7734	-290.6528	-375.0966	-404.1993	-393.1363	-337.7814	-245.7552	-144.0152	-67.0344	-40.6189	(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												2095.5459	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												2715.8837	(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)												156.7569	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3574.3662	(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												1479.8204	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2095.5459	6.5500	137.2583	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2715.8837	6.5500	177.8904	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	28.4300	24.4498	(249)
Energy for lighting	156.7569	28.4300	44.5660	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-947.4948	28.4300	-269.3728	
PV Unit electricity exported	-2626.8714	5.8100	-152.6212	
Total			-421.9940	(252)
Total energy cost			66.1704	(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	2095.5459	0.2100	440.0646	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2715.8837	0.2100	570.3356	(264)
Space and water heating			1010.4002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	156.7569	0.1443	22.6249	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-947.4948	0.1361	-128.9284	
PV Unit electricity exported	-2626.8714	0.1254	-329.4743	
Total			-458.4028	(269)
Total CO2, kg/year			586.5516	(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	2095.5459	1.1300	2367.9669	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2715.8837	1.1300	3068.9486	(278)
Space and water heating			5436.9155	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	156.7569	1.5338	240.4390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-947.4948	1.5030	-1424.0617	
PV Unit electricity exported	-2626.8714	0.4603	-1209.1815	
Total			-2633.2432	(283)
Total Primary energy kWh/year			3174.2121	(286)

SAP 10 EPC IMPROVEMENTS

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Proposed

Current energy efficiency rating: A 98
Current environmental impact rating: B 91

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 + 0.7 -£ 32 -151 kg (25.8%)

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

Potential energy efficiency rating: A 98
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 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	£69	£69	£0
Mains gas	£419	£419	£0
Space heating	£266	£266	£0
Water heating	£178	£178	£0
Lighting	£45	£45	£0
Generated (PV)	-£422	-£422	£0
Total cost of fuels	£66	£66	£0
Total cost of uses	£67	£67	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	49 kWh/m²	49 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	64.9900 (1b)	x 2.4000 (2b)	= 155.9760 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	155.9760 (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	2 * 10 = 20.0000 (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) = 20.0000 / (5) = 0.1282 (8)

Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

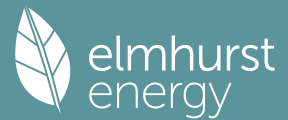
Blower Door
Yes
5.0100 (17)
0.3787 (18)
1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3503 (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	1.1750	1.1750 (22a)
Adj infilt rate	0.4467	0.4379	0.4291	0.3854	0.3766	0.3328	0.3328	0.3240	0.3503	0.3766	0.3941	0.4116 (22b)
Effective ac	0.5998	0.5959	0.5921	0.5742	0.5709	0.5554	0.5554	0.5525	0.5614	0.5709	0.5777	0.5847 (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								
Entrance door			1.9700	1.2000	2.3640			(26)
Glazed door			3.8000	1.3258	5.0379			(27)
Window			11.9300	1.1450	13.6603			(27)
Heat Loss Floor 1			64.9900	0.1200	7.7988	65.5200	4258.1448	(28a)
External Wall 1	80.6400	17.7000	62.9400	0.1700	10.6998	55.6400	3501.9816	(29a)
External Roof 1	64.9900		64.9900	0.1043	6.7762	12.1700	790.9283	(30)
Total net area of external elements Aum(A, m2)			210.6200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	46.3370		(33)
Main dwelling								
Internal Wall 1			96.8400			75.0000	7263.0000	(32c)
Internal Wall 2			9.7400			9.0000	87.6600	(32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	15901.7147 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								244.6794 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				16.4200	0.1750	2.8735		
E3 Sill				15.4800	0.0230	0.3560		
E4 Jamb				24.0000	0.0180	0.4320		
E5 Ground floor (normal)				33.6000	0.0530	1.7808		
E16 Corner (normal)				9.6000	0.0400	0.3840		
E10 Eaves (insulation at ceiling level)				21.5200	0.0550	1.1836		
E12 Gable (insulation at ceiling level)				12.0800	0.0370	0.4470		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.4569 (36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	53.7939 (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	30.8705	30.6711	30.4757	29.5578	29.3860	28.5865	28.5865	28.4385	28.8945	29.3860	29.7334	30.0967	(38)	
Average = Sum(39)m / 12 =	84.6644	84.4650	84.2696	83.3516	83.1799	82.3804	82.3804	82.2324	82.6884	83.1799	83.5273	83.8906	(39)	83.3508
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.3027	1.2997	1.2967	1.2825	1.2799	1.2676	1.2676	1.2653	1.2723	1.2799	1.2852	1.2908	(40)	1.2825
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31		

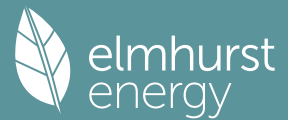
4. Water heating energy requirements (kWh/year)

Assumed occupancy														2.1187 (42)
Hot water usage for mixer showers														
Hot water usage for baths	74.6780	73.5558	71.9204	68.7914	66.4823	63.9072	62.4436	64.0665	65.8456	68.6105	71.8067	74.3919	(42a)	
Hot water usage for other uses	25.8144	25.4310	24.8912	23.8957	23.1503	22.3238	21.8774	22.4135	22.9972	23.8816	24.8976	25.7272	(42b)	
Average daily hot water use (litres/day)	36.3271	35.0061	33.6851	32.3641	31.0432	29.7222	29.7222	31.0432	32.3641	33.6851	35.0061	36.3271	(42c)	36.3271
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	136.8196	133.9929	130.4967	125.0513	120.6758	115.9533	114.0432	117.5232	121.2070	126.1773	131.7104	136.4462	(44)	
Energy content (annual)	216.6887	190.8041	200.5686	171.1890	162.4529	142.5781	137.9253	145.5183	149.4604	171.2213	187.6456	213.6417	(45)	
Distribution loss (46)m = 0.15 x (45)m	32.5033	28.6206	30.0853	25.6783	24.3679	21.3867	20.6888	21.8277	22.4191	25.6832	28.1468	32.0463	(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	26.1868	23.6475	26.1651	25.2800	26.0973	25.2286	26.0501	26.0630	25.2369	26.1080	25.3046	26.1811	(61)	
Total heat required for water heating calculated for each month	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228	(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	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228	(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	78.5957	69.3542	73.2303	63.2403	60.5399	53.7144	52.3727	54.9006	56.0048	63.4581	68.7183	77.5811	(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	22.1906	19.7095	16.0288	12.1348	9.0709	7.6581	8.2748	10.7559	14.4366	18.3305	21.3944	22.8073	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.6183	279.4888	272.2554	256.8563	237.4178	219.1483	206.9432	204.0727	211.3061	226.7052	246.1437	264.4132	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	(69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	(71)	
Water heating gains (Table 5)	105.6394	103.2057	98.4278	87.8338	81.3708	74.6033	70.3934	73.7911	77.7844	85.2931	95.4421	104.2757	(72)	
Total internal gains	499.6518	497.6075	481.9156	452.0285	423.0631	393.6132	377.8150	380.8233	395.7307	425.5324	458.1838	486.6998	(73)	

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6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Specific data		Specific data		factor		W
					W/m2	or Table 6b		or Table 6c		Table 6d		
Southwest				3.8000	36.7938	0.6300		0.7000		0.7700		42.7298 (79)
Northeast				3.6700	11.2829	0.6300		0.7000		0.7700		12.6549 (75)
Southeast				3.0900	36.7938	0.6300		0.7000		0.7700		34.7460 (77)
Southwest				2.3800	36.7938	0.6300		0.7000		0.7700		26.7623 (79)
Northwest				2.7900	11.2829	0.6300		0.7000		0.7700		9.6205 (81)
Solar gains	126.5136	222.8984	324.6325	435.1769	517.5020	526.9854	502.5662	439.1261	362.5962	251.6492	152.8815	107.3974 (83)
Total gains	626.1654	720.5060	806.5481	887.2055	940.5651	920.5986	880.3812	819.9494	758.3269	677.1817	611.0653	594.0972 (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	52.1724	52.2955	52.4168	52.9941	53.1035	53.6188	53.6188	53.7154	53.4192	53.1035	52.8826	52.6536	
alpha	4.4782	4.4864	4.4945	4.5329	4.5402	4.5746	4.5746	4.5810	4.5613	4.5402	4.5255	4.5102	
util living area	0.9853	0.9719	0.9415	0.8675	0.7316	0.5527	0.4075	0.4541	0.6883	0.9038	0.9733	0.9881 (86)	
MIT	19.9558	20.1235	20.3646	20.6384	20.8268	20.9097	20.9278	20.9251	20.8724	20.6209	20.2365	19.9231 (87)	
Th 2	19.8387	19.8411	19.8435	19.8545	19.8566	19.8663	19.8663	19.8681	19.8626	19.8566	19.8524	19.8480 (88)	
util rest of house	0.9808	0.9636	0.9243	0.8308	0.6668	0.4632	0.3047	0.3460	0.5980	0.8679	0.9638	0.9845 (89)	
MIT 2	18.6487	18.8608	19.1595	19.4897	19.6883	19.7677	19.7782	19.7791	19.7392	19.4818	19.0146	18.6147 (90)	
Living area fraction	fLA = Living area / (4) =												0.4531 (91)
MIT	19.2410	19.4330	19.7056	20.0102	20.2042	20.2852	20.2992	20.2984	20.2527	19.9980	19.5683	19.2076 (92)	
Temperature adjustment													-0.1500
adjusted MIT	19.0910	19.2830	19.5556	19.8602	20.0542	20.1352	20.1492	20.1484	20.1027	19.8480	19.4183	19.0576 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9770	0.9586	0.9192	0.8310	0.6788	0.4851	0.3307	0.3733	0.6184	0.8675	0.9593	0.9812 (94)
Useful gains	611.7932	690.6731	741.3847	737.3047	638.4275	446.5540	291.1171	306.0559	468.9503	587.4789	586.1909	582.9126 (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	1252.2731	1214.8571	1100.1869	913.5528	694.9030	455.9934	292.3808	308.2413	496.3556	769.2484	1028.9175	1246.4128 (97)
Space heating kWh	476.5170	352.2516	266.9489	126.8987	42.0178	0.0000	0.0000	0.0000	0.0000	135.2365	318.7632	493.6441 (98a)
Space heating requirement - total per year (kWh/year)												2212.2778
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	476.5170	352.2516	266.9489	126.8987	42.0178	0.0000	0.0000	0.0000	0.0000	135.2365	318.7632	493.6441 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2212.2778
Space heating per m2										(98c) / (4) =		34.0403 (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 %)												88.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	476.5170	352.2516	266.9489	126.8987	42.0178	0.0000	0.0000	0.0000	0.0000	135.2365	318.7632	493.6441 (98)
Space heating efficiency (main heating system 1)	88.4000	88.4000	88.4000	88.4000	88.4000	0.0000	0.0000	0.0000	0.0000	88.4000	88.4000	88.4000 (210)
Space heating fuel (main heating system)	539.0464	398.4747	301.9784	143.5505	47.5314	0.0000	0.0000	0.0000	0.0000	152.9825	360.5918	558.4210 (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	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228 (64)
Efficiency of water heater (217)m	88.3324	88.3242	88.3080	88.2784	88.2364	88.2000	88.2000	88.2000	88.2000	88.2812	88.3198	88.2000 (216)
Fuel for water heating, kWh/month	274.9564	242.8005	256.7531	222.5562	213.6876	190.2570	185.9132	194.5366	198.0694	223.5236	241.1126	271.4939 (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	19.4233	15.5821	14.0299	10.2789	7.9397	6.4868	7.2429	9.4146	12.2286	16.0446	18.1223	19.9631 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-48.1960	-65.3825	-90.2831	-96.2153	-98.7706	-90.4356	-89.2844	-86.6627	-80.9887	-72.4623	-51.9516	-41.8498 (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	-39.9670	-85.7554	-176.0587	-270.8699	-361.4369	-364.2480	-358.4881	-300.4923	-215.4537	-123.3464	-53.4565	-31.3419 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												2502.5767	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												2715.6601	(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)												156.7569	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3293.3975	(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												2167.5962	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2502.5767	3.6400	91.0938	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2715.6601	3.6400	98.8500	(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	156.7569	16.4900	25.8492	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.4827	16.4900	-150.4684	
PV Unit electricity exported	-2380.9148	5.5900	-133.0931	
Total			-283.5615	(252)
Total energy cost			38.4129	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.1257	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	97.9620	
SAP rating (Section 12)		98	(258)
SAP band		A	

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

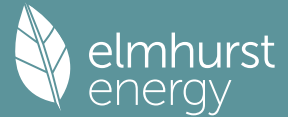
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2502.5767	0.2100	525.5411	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2715.6601	0.2100	570.2886	(264)
Space and water heating			1095.8297	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	156.7569	0.1443	22.6249	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.4827	0.1357	-123.7977	
PV Unit electricity exported	-2380.9148	0.1254	-298.4730	
Total			-422.2707	(269)
Total CO2, kg/year			708.1131	(272)
CO2 emissions per m2			10.9000	(273)
EI value			91.3731	
EI rating			91	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	64.9900	(1b) x 2.4000 (2b)	= 155.9760	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.9900			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	155.9760	(5)

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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	2	*	10	=	20.0000	(7a)						
Number of passive vents	0	*	10	=	0.0000	(7b)						
Number of flueless gas fires	0	*	40	=	0.0000	(7c)						

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											
Pressure test	20.0000 / (5) =											
Pressure Test Method	Yes											
Measured/design AP50	Blower Door											
Infiltration rate	5.0100 (17)											
Number of sides sheltered	0.3787 (18)											
	1 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] =											
Infiltration rate adjusted to include shelter factor	0.9250 (20)											
	(21) = (18) x (20) =											
	0.3503 (21)											

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Adj infilt rate	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Effective ac	0.3854	0.3591	0.3591	0.3416	0.3416	0.2978	0.2978	0.2890	0.2978	0.3328	0.3240	0.3503 (22b)
	0.5742	0.5645	0.5645	0.5583	0.5583	0.5443	0.5443	0.5418	0.5443	0.5554	0.5525	0.5614 (25)

3. Heat losses and heat loss parameter

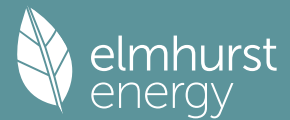
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Entrance door			1.9700	1.2000	2.3640			(26)
Glazed door			3.8000	1.3258	5.0379			(27)
Window			11.9300	1.1450	13.6603			(27)
Heat Loss Floor 1			64.9900	0.1200	7.7988	65.5200	4258.1448	(28a)
External Wall 1	80.6400	17.7000	62.9400	0.1700	10.6998	55.6400	3501.9816	(29a)
External Roof 1	64.9900		64.9900	0.1043	6.7762	12.1700	790.9283	(30)
Total net area of external elements Aum(A, m2)			210.6200					(31)
Fabric heat loss, W/K = Sum (A x U)					46.3370			(32)
Main dwelling								(33)
Internal Wall 1			96.8400			75.0000	7263.0000	(32c)
Internal Wall 2			9.7400			9.0000	87.6600	(32c)
Heat capacity Cm = Sum(A x k)								(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				16.4200	0.1750	2.8735		
E3 Sill				15.4800	0.0230	0.3560		
E4 Jamb				24.0000	0.0180	0.4320		
E5 Ground floor (normal)				33.6000	0.0530	1.7808		
E16 Corner (normal)				9.6000	0.0400	0.3840		
E10 Eaves (insulation at ceiling level)				21.5200	0.0550	1.1836		
E12 Gable (insulation at ceiling level)				12.0800	0.0370	0.4470		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4569	(36)
Point Thermal bridges							0.0000	(36a)
Total fabric heat loss							53.7939	(37)
								(33) + (36) + (36a) =

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	29.5578	29.0544	29.0544	28.7385	28.7385	28.0180	28.0180	27.8858	28.0180	28.5865	28.4385	28.8945 (38)
Average = Sum(39)m / 12 =	83.3516	82.8483	82.8483	82.5324	82.5324	81.8119	81.8119	81.6796	81.8119	82.3804	82.2324	82.6884 (39)
												82.3775
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2825	1.2748	1.2748	1.2699	1.2699	1.2588	1.2588	1.2568	1.2588	1.2676	1.2653	1.2723 (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	2.1187 (42)											
Hot water usage for mixer showers	74.3919 (42a)											
Hot water usage for baths	25.7272 (42b)											
Hot water usage for other uses	36.3271 (42c)											
Average daily hot water use (litres/day)	125.8093 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	136.8196	133.9929	130.4967	125.0513	120.6758	115.9533	114.0432	117.5232	121.2070	126.1773	131.7104	136.4462 (44)
Energy content (annual)	216.6887	190.8041	200.5686	171.1890	162.4529	142.5781	137.9253	145.5183	149.4604	171.2213	187.6456	213.6417 (45)
Distribution loss (46)m = 0.15 x (45)m	2089.6940											
Water storage loss:	32.5033											
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	26.1868	23.6475	26.1651	25.2800	26.0973	25.2286	26.0501	26.0630	25.2369	26.1080	25.3046	26.1811 (61)
Total heat required for water heating calculated for each month	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228 (62)

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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	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228 (64)
Total per year (kWh/year) = Sum(64)m =												2397.2429 (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	78.5957	69.3542	73.2303	63.2403	60.5399	53.7144	52.3727	54.9006	56.0048	63.4581	68.7183	77.5811 (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	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	127.1191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1906	19.7095	16.0288	12.1348	9.0709	7.6581	8.2748	10.7559	14.4366	18.3305	21.3944	22.8073	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.6183	279.4888	272.2554	256.8563	237.4178	219.1483	206.9432	204.0727	211.3061	226.7052	246.1437	264.4132	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	49.8306	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	-84.7460	(71)
Water heating gains (Table 5)	105.6394	103.2057	98.4278	87.8338	81.3708	74.6033	70.3934	73.7911	77.7844	85.2931	95.4421	104.2757	(72)
Total internal gains	499.6518	497.6075	481.9156	452.0285	423.0631	393.6132	377.8150	380.8233	395.7307	425.5324	458.1838	486.6998	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Southwest				3.8000	42.9509		0.6300	0.7000	0.7700	49.8802 (79)		
Northeast				3.6700	13.7758		0.6300	0.7000	0.7700	15.4509 (75)		
Southeast				3.0900	42.9509		0.6300	0.7000	0.7700	40.5605 (77)		
Southwest				2.3800	42.9509		0.6300	0.7000	0.7700	31.2407 (79)		
Northwest				2.7900	13.7758		0.6300	0.7000	0.7700	11.7460 (81)		
Solar gains	148.8783	229.7265	333.8766	457.5575	532.6496	574.7289	542.3157	481.3790	398.6349	278.8346	177.3223	127.0592 (83)
Total gains	648.5302	727.3341	815.7922	909.5860	955.7127	968.3421	920.1306	862.2024	794.3656	704.3670	635.5061	613.7590 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)	21.0000 (85)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.9941	53.3161	53.3161	53.5201	53.5201	53.9914	53.9914	54.0789	53.9914	53.6188	53.7154	53.4192
alpha	4.5329	4.5544	4.5544	4.5680	4.5680	4.5994	4.5994	4.6053	4.5994	4.5746	4.5810	4.5613
util living area	0.9805	0.9660	0.9256	0.8305	0.6642	0.4494	0.3014	0.3395	0.6066	0.8646	0.9624	0.9840 (86)
MIT	20.0646	20.2169	20.4649	20.7142	20.8704	20.9246	20.9318	20.9311	20.9015	20.7085	20.3487	20.0373 (87)
Th 2	19.8545	19.8606	19.8606	19.8645	19.8645	19.8732	19.8732	19.8748	19.8732	19.8663	19.8681	19.8626 (88)
util rest of house	0.9745	0.9558	0.9038	0.7857	0.5904	0.3589	0.2020	0.2342	0.5095	0.8165	0.9491	0.9790 (89)
MIT 2	18.7986	18.9930	19.2948	19.5813	19.7349	19.7836	19.7867	19.7883	19.7706	19.5863	19.1661	18.7708 (90)
Living area fraction	fLA = Living area / (4) = 0.4531 (91)											
MIT	19.3723	19.5476	19.8250	20.0947	20.2495	20.3007	20.3056	20.3062	20.2831	20.0948	19.7020	19.3447 (92)
Temperature adjustment	-0.1500											
adjusted MIT	19.2223	19.3976	19.6750	19.9447	20.0995	20.1507	20.1556	20.1562	20.1331	19.9448	19.5520	19.1947 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9702	0.9507	0.8996	0.7892	0.6065	0.3815	0.2270	0.2607	0.5330	0.8204	0.9445	0.9752 (94)
Useful gains	629.2330	691.4717	733.9271	717.8506	579.6283	369.4614	208.9015	224.7798	423.3583	577.8316	600.2073	598.5124 (95)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W	1193.7879	1151.3921	1025.2497	845.5180	610.6947	372.2981	209.0787	225.1230	436.3079	703.9231	966.3967	1182.0081 (97)
Space heating kWh	420.0289	309.0665	216.7441	91.9206	23.1134	0.0000	0.0000	0.0000	0.0000	93.8121	263.6564	434.1208 (98a)
Space heating requirement - total per year (kWh/year)	1852.4626											
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	420.0289	309.0665	216.7441	91.9206	23.1134	0.0000	0.0000	0.0000	0.0000	93.8121	263.6564	434.1208 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1852.4626											
Space heating per m ²	(98c) / (4) = 28.5038 (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 %)	88.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	420.0289	309.0665	216.7441	91.9206	23.1134	0.0000	0.0000	0.0000	0.0000	93.8121	263.6564	434.1208	(98)
Space heating efficiency (main heating system 1)	88.4000	88.4000	88.4000	88.4000	88.4000	0.0000	0.0000	0.0000	0.0000	88.4000	88.4000	88.4000	(210)
Space heating fuel (main heating system)	475.1458	349.6227	245.1856	103.9826	26.1463	0.0000	0.0000	0.0000	0.0000	106.1223	298.2538	491.0868	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	242.8755	214.4516	226.7336	196.4690	188.5502	167.8067	163.9754	171.5813	174.6972	197.3293	212.9501	239.8228	(64)
Efficiency of water heater (217)m	88.3266	88.3180	88.2976	88.2636	88.2218	88.2000	88.2000	88.2000	88.2000	88.2643	88.3105	88.2000	(216)
Fuel for water heating, kWh/month	274.9743	242.8177	256.7834	222.5933	213.7229	190.2570	185.9132	194.5366	198.0694	223.5663	241.1379	271.5117	(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	19.4233	15.5821	14.0299	10.2789	7.9397	6.4868	7.2429	9.4146	12.2286	16.0446	18.1223	19.9631	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-54.5476	-67.2173	-91.9682	-97.9019	-99.3991	-91.6688	-90.3861	-88.4832	-83.7658	-76.7163	-57.6874	-47.7532	(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)	-51.3191	-91.4887	-185.7734	-290.6528	-375.0966	-404.1993	-393.1363	-337.7814	-245.7552	-144.0152	-67.0344	-40.6189	(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												2095.5459	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												2715.8837	(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)												156.7569	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3574.3662	(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												1479.8204	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2095.5459	6.5500	137.2583	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2715.8837	6.5500	177.8904	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	28.4300	24.4498	(249)
Energy for lighting	156.7569	28.4300	44.5660	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-947.4948	28.4300	-269.3728	
PV Unit electricity exported	-2626.8714	5.8100	-152.6212	
Total			-421.9940	(252)
Total energy cost			66.1704	(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	2095.5459	0.2100	440.0646	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2715.8837	0.2100	570.3356	(264)
Space and water heating			1010.4002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	156.7569	0.1443	22.6249	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-947.4948	0.1361	-128.9284	
PV Unit electricity exported	-2626.8714	0.1254	-329.4743	
Total			-458.4028	(269)
Total CO2, kg/year			586.5516	(272)

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

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	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2095.5459	1.1300	2367.9669	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2715.8837	1.1300	3068.9486	(278)
Space and water heating			5436.9155	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	156.7569	1.5338	240.4390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-947.4948	1.5030	-1424.0617	
PV Unit electricity exported	-2626.8714	0.4603	-1209.1815	
Total			-2633.2432	(283)
Total Primary energy kWh/year			3174.2121	(286)