

# Full SAP Calculation Printout



Property Reference	Flat 5		Issued on Date	26/07/2023	
Assessment Reference	Flat 5 - Baseline	Prop Type Ref			
Property	Flat 3, Pier View Hotel, 34 Oldminster Road, Sharpness, Berkeley, GL13 9NA				
SAP Rating	78 C	DER	22.87	TER	10.74
Environmental	80 C	% DER < TER			-112.94
CO <sub>2</sub> Emissions (t/year)	1.84	DFEE	70.94	TTEE	31.50
Compliance Check	See BREL	% DFEE < TTEE			-125.25
% DPER < TPER	-123.53	DPER	126.47	TPER	56.58
Assessor Details				Assessor ID	H055-0001
Client					

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

## 1. Overall dwelling characteristics

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	91.1000 (1b)	x 2.3300 (2b)	= 212.2630 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	91.1000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 212.2630 (5)

## 2. Ventilation rate

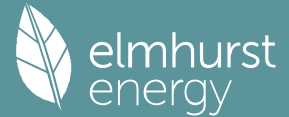
			m <sup>3</sup> per hour
Number of open chimneys	0 * 80 =		0.0000 (6a)
Number of open flues	0 * 20 =		0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =		0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =		0.0000 (6d)
Number of flues attached to other heater	0 * 35 =		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) =		Air changes per hour	20.0000 / (5) = 0.0942 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50			15.0000 (17)
Infiltration rate			0.8442 (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) =		0.7809 (21)

Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9957	0.9761	0.9566	0.8590	0.8395	0.7419	0.7419	0.7223	0.7809	0.8395	0.8785	0.9176 (22b)
Effective ac	0.9957	0.9764	0.9576	0.8689	0.8524	0.7752	0.7752	0.7609	0.8049	0.8524	0.8859	0.9210 (25)

## 3. Heat losses and heat loss parameter

Element	Gross m <sup>2</sup>	Openings m <sup>2</sup>	NetArea m <sup>2</sup>	U-value W/m <sup>2</sup> K	A x U W/K	K-value kJ/m <sup>2</sup> K	A x K kJ/K
Door			1.7200	1.4000	2.4080		(26)
New Windows (Uw = 1.40)			5.1200	1.3258	6.7879		(27)
Exposed Floor			4.0200	0.2500	1.0050	20.0000	80.4000 (28b)
External Wall	70.5900	3.9200	66.6700	0.3000	20.0010	110.0000	7333.7000 (29a)
Corridor Wall	9.4700	1.7200	7.7500	0.3000	2.3250	9.0000	69.7500 (29a)
Dormer Wall	2.1900	1.2000	0.9900	0.3000	0.2970	9.0000	8.9100 (29a)
Warm Pitched Roof	42.7800		42.7800	0.1700	7.2726	9.0000	385.0200 (30)
Cold Pitched Roof	63.0300		63.0300	0.1500	9.4545	9.0000	567.2700 (30)

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Total net area of external elements $\sum(A, m^2)$	192.0800												(31)
Fabric heat loss, $W/K = \sum(A \times U)$	(26)...	(30) + (32) =	49.5510										(33)
Party Wall	7.9100	0.0000	0.0000					180.0000					(32)
Party Floor	87.0800							40.0000					(32d)
Internal Wall	160.0000							9.0000					(32c)

Heat capacity $C_m = \sum(A \times k)$	(28)...	(30) + (32) + (32a)...	(32e) =	14792.0500									(34)
Thermal mass parameter (TMP = $C_m / TFA$ ) in $kJ/m^2K$													(35)
Thermal bridges (Default value 0.200 * total exposed area)													(36)
Point Thermal bridges													(36a) =
Total fabric heat loss	(33) + (36) + (36a) =												87.9670 (37)

Ventilation heat loss calculated monthly (38) $m = 0.33 \times (25)m \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
(38) $m$	69.7431	68.3949	67.0734	60.8663	59.7050	54.2988	54.2988	53.2976	56.3812	59.7050	62.0543	64.5105	
Heat transfer coeff	157.7101	156.3619	155.0404	148.8333	147.6719	142.2658	142.2658	141.2646	144.3481	147.6719	150.0213	152.4774	(39)
Average = $\sum(39)m / 12 =$													148.8277

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.7312	1.7164	1.7019	1.6337	1.6210	1.5616	1.5616	1.5507	1.5845	1.6210	1.6468	1.6737	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

#### 4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6405 (42)
Hot water usage for mixer showers	120.9844	119.1663	116.5168	111.4477	107.7067	103.5349	101.1636	103.7930	106.6752	111.1545	116.3326	120.5209	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	41.6711	40.1558	38.6405	37.1252	35.6099	34.0946	34.0946	35.6099	37.1252	38.6405	40.1558	41.6711	(42c)
Average daily hot water use (litres/day)													149.4264 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(44)
Energy content	162.6556	159.3221	155.1574	148.5729	143.3166	137.6295	135.2582	139.4029	143.8005	149.7951	156.4884	162.1920	
Energy content (annual)	257.6067	226.8725	238.4711	203.3888	192.9317	169.2315	163.5831	172.6099	177.3203	203.2705	222.9465	253.9535	(45)
Distribution loss (46) $m = 0.15 \times (45)m$	38.6410	34.0309	35.7707	30.5083	28.9398	25.3847	24.5375	25.8915	26.5981	30.4906	33.4420	38.0930	(46)
Total = $\sum(45)m =$													2482.1861

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	0.5803	0.5564	0.6445	0.6300	0.6585	0.6353	0.6374	0.6297	0.6000	0.6148	0.5847	0.5791	(61)
Total heat required for water heating calculated for each month	258.1870	227.4290	239.1156	204.0189	193.5902	169.8668	164.2205	173.2395	177.9204	203.8852	223.5312	254.5327	(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	258.1870	227.4290	239.1156	204.0189	193.5902	169.8668	164.2205	173.2395	177.9204	203.8852	223.5312	254.5327	(64)
Total per year (kWh/year)													2489.5369 (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	85.7993	75.5742	79.4528	67.7843	64.3144	56.4283	54.5507	57.5502	59.1090	67.7411	74.2759	84.5843	(65)
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#### 5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66) $m$	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	155.5677	172.2357	155.5677	160.7533	155.5677	160.7533	155.5677	155.5677	160.7533	155.5677	160.7533	155.5677	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.0869	243.5887	237.2844	223.8633	206.9217	190.9989	180.3615	177.8598	184.1640	197.5851	214.5268	230.4496	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	(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)	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	(71)
Water heating gains (Table 5)	115.3216	112.4617	106.7913	94.1449	86.4441	78.3726	73.3209	77.3524	82.0959	91.0499	103.1609	113.6886	(72)
Total internal gains	577.5835	593.8932	565.2507	544.3687	514.5407	492.7321	471.8573	473.3871	489.6204	509.8099	544.0482	565.3131	(73)

#### 6. Solar gains

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[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North			1.2200	10.6334	0.6300	0.7000	0.7700	3.9646 (74)	
East			2.7000	19.6403	0.6300	0.7000	0.7700	16.2063 (76)	
West			1.2000	19.6403	0.6300	0.7000	0.7700	7.2028 (80)	

Solar gains	27.3737	53.3697	88.2892	130.6676	162.6517	167.8082	159.2111	134.9331	103.1897	63.3563	34.0792	22.5556 (83)
Total gains	604.9572	647.2629	653.5399	675.0363	677.1925	660.5402	631.0684	608.3202	592.8102	573.1662	578.1275	587.8687 (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, ni1,m (See Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	26.0535	26.2782	26.5021	27.6074	27.8245	28.8819	28.8819	29.0866	28.4652	27.8245	27.3888	26.9476
alpha	2.7369	2.7519	2.7668	2.8405	2.8550	2.9255	2.9255	2.9391	2.8977	2.8550	2.8259	2.7965
util living area	0.9862	0.9822	0.9765	0.9606	0.9279	0.8501	0.7422	0.7702	0.8963	0.9616	0.9806	0.9874 (86)
MIT	18.1076	18.3196	18.6994	19.3279	19.9160	20.4854	20.7676	20.7320	20.3182	19.5673	18.8034	18.1511 (87)
Th 2	19.5186	19.5291	19.5395	19.5887	19.5980	19.6416	19.6416	19.6497	19.6247	19.5980	19.5792	19.5597 (88)
util rest of house	0.9827	0.9776	0.9698	0.9476	0.8987	0.7751	0.5932	0.6338	0.8414	0.9463	0.9747	0.9842 (89)
MIT 2	16.9549	17.1721	17.5562	18.2087	18.7865	19.3389	19.5555	19.5411	19.1865	18.4538	17.6861	17.0240 (90)
Living area fraction	fLA = Living area / (4) = 0.2124 (91)											
MIT	17.1997	17.4158	17.7991	18.4464	19.0264	19.5824	19.8130	19.7940	19.4269	18.6903	17.9234	17.2634 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.1997	17.4158	17.7991	18.4464	19.0264	19.5824	19.8130	19.7940	19.4269	18.6903	17.9234	17.2634 (93)

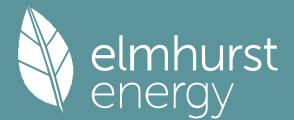
## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9743	0.9676	0.9580	0.9328	0.8825	0.7709	0.6161	0.6519	0.8308	0.9321	0.9645	0.9765 (94)
Useful gains	589.4123	626.3091	626.0974	629.6444	597.6330	509.2198	388.7844	396.5368	492.5306	534.2453	557.6202	574.0796 (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	2034.4161	1956.9985	1751.8102	1420.8217	1081.9049	708.8215	457.0942	479.4550	768.9285	1194.7116	1623.7417	1991.8696 (97)
Space heating kWh	1075.0828	894.2232	837.5303	569.6477	360.2983	0.0000	0.0000	0.0000	0.0000	491.3869	767.6075	1054.8358 (98a)
Space heating requirement - total per year (kWh/year)	6050.6125											
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	1075.0828	894.2232	837.5303	569.6477	360.2983	0.0000	0.0000	0.0000	0.0000	491.3869	767.6075	1054.8358 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6050.6125											
Space heating per m2	(98c) / (4) = 66.4173 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												
Fraction of space heat from main system(s)												
Efficiency of main space heating system 1 (in %)												
Efficiency of main space heating system 2 (in %)												
Efficiency of secondary/supplementary heating system, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1075.0828	894.2232	837.5303	569.6477	360.2983	0.0000	0.0000	0.0000	0.0000	491.3869	767.6075	1054.8358 (98)
Space heating efficiency (main heating system 1)	89.1000	89.1000	89.1000	89.1000	89.1000	0.0000	0.0000	0.0000	0.0000	89.1000	89.1000	89.1000 (210)
Space heating fuel (main heating system)	1206.6025	1003.6176	939.9891	639.3352	404.3752	0.0000	0.0000	0.0000	0.0000	551.5005	861.5123	1183.8786 (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	258.1870	227.4290	239.1156	204.0189	193.5902	169.8668	164.2205	173.2395	177.9204	203.8852	223.5312	254.5327 (64)
Efficiency of water heater (217)m	88.2754	88.2370	88.1556	87.9809	87.6228	85.0000	85.0000	85.0000	85.0000	87.8573	88.1412	88.2723 (217)
Fuel for water heating, kWh/month	292.4788	257.7478	271.2426	231.8899	220.9359	199.8433	193.2005	203.8112	209.3181	232.0641	253.6059	288.3494 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)

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Lighting	39.7611	31.8978	28.7205	21.0418	16.2533	13.2791	14.8268	19.2725	25.0330	32.8447	37.0980	40.8662	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												6790.8109	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												85.0000	
Water heating fuel used												2854.4877	(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)												320.8950	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												10052.1935	(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	6790.8109	0.2100	1426.0703 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2854.4877	0.2100	599.4424 (264)
Space and water heating			2025.5127 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	320.8950	0.1443	46.3151 (268)
Total CO2, kg/year			2083.7570 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			22.8700 (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	6790.8109	1.1300	7673.6163 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2854.4877	1.1300	3225.5711 (278)
Space and water heating			10899.1874 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	320.8950	1.5338	492.1994 (282)
Total Primary energy kWh/year			11521.4876 (286)
Dwelling Primary energy Rate (DPER)			126.4700 (287)

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

## 1. Overall dwelling characteristics

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	91.1000 (1b)	x 2.3300 (2b)	= 212.2630 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.2630 (5)



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Distribution loss (46)m = 0.15 x (45)m	30.8024	27.0890	28.4446	24.2670	23.0082	20.1767	19.5323	20.6340	21.2168	24.3200	26.6618	30.3732 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	256.3084	226.6205	240.5894	211.0949	204.3468	183.8261	181.1742	188.5186	190.7605	213.0924	227.0605	253.4470 (62)
WWHS	-40.2247	-35.5751	-37.2522	-30.8463	-28.7476	-24.5995	-23.0582	-24.5200	-25.4516	-30.0047	-33.9917	-39.4798 (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)
FGHS	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	216.0836	191.0454	203.3372	180.2486	175.5992	159.2266	158.1160	163.9985	165.3089	183.0877	193.0688	213.9672 (64)
												2203.0878 (64)
12Total per year (kWh/year)												2203 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	81.0184	71.5541	75.7919	66.1206	63.7412	57.0537	56.0363	58.4783	59.3594	66.6491	71.4291	80.0670 (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	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	155.5677	172.2357	155.5677	160.7533	155.5677	160.7533	155.5677	155.5677	160.7533	155.5677	160.7533	155.5677 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.0869	243.5887	237.2844	223.8633	206.9217	190.9989	180.3615	177.8598	184.1640	197.5851	214.5268	230.4496 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024 (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)	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192 (71)
Water heating gains (Table 5)	108.8957	106.4793	101.8708	91.8341	85.6737	79.2412	75.3176	78.5999	82.4436	89.5821	99.2071	107.6170 (72)
Total internal gains	571.1576	587.9108	560.3301	542.0580	513.7703	493.6007	473.8540	474.6346	489.9682	508.3422	540.0944	559.2414 (73)

## 6. Solar gains

[Jan]	Area m <sup>2</sup>	Solar flux Table 6a W/m <sup>2</sup>	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646 (74)						
East	2.7000	19.6403	0.6300	0.7000	0.7700	16.2063 (76)						
West	1.2000	19.6403	0.6300	0.7000	0.7700	7.2028 (80)						
Solar gains	27.3737	53.3697	88.2892	130.6676	162.6517	167.8082	159.2111	134.9331	103.1897	63.3563	34.0792	22.5556 (83)
Total gains	598.5313	641.2805	648.6193	672.7256	676.4220	661.4088	633.0651	609.5677	593.1579	571.6985	574.1736	581.7970 (84)

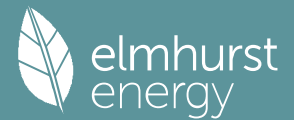
## 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, n <sub>l,m</sub> (see Table 9a)												
tau	48.1103	48.2741	48.4357	49.2093	49.3568	50.0553	50.0553	50.1868	49.7839	49.3568	49.0594	48.7522
alpha	4.2074	4.2183	4.2290	4.2806	4.2905	4.3370	4.3370	4.3458	4.3189	4.2905	4.2706	4.2501
util living area	0.9848	0.9780	0.9673	0.9337	0.8614	0.7092	0.5479	0.5863	0.7951	0.9356	0.9746	0.9864 (86)
MIT	19.5608	19.7207	19.9618	20.3389	20.6685	20.9023	20.9751	20.9666	20.8303	20.4273	19.9552	19.5471 (87)
Th 2	20.1357	20.1384	20.1411	20.1534	20.1558	20.1666	20.1666	20.1686	20.1624	20.1558	20.1511	20.1462 (88)
util rest of house	0.9817	0.9734	0.9601	0.9180	0.8268	0.6410	0.4536	0.4929	0.7373	0.9174	0.9686	0.9836 (89)
MIT 2	18.4477	18.6524	18.9596	19.4387	19.8345	20.0931	20.1540	20.1505	20.0221	19.5539	18.9604	18.4376 (90)
Living area fraction	18.6842	18.8793	19.1724	19.6299	20.0116	20.2649	20.3284	20.3238	20.1938	19.7394	19.1717	18.6732 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6842	18.8793	19.1724	19.6299	20.0116	20.2649	20.3284	20.3238	20.1938	19.7394	19.1717	18.6732 (93)

## 8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Utilisation	0.9745	0.9646	0.9496	0.9063	0.8201	0.6496	0.4725	0.5111	0.7397	0.9064	0.9594	0.9770 (94)
Useful gains	583.2722	618.5815	615.9229	609.6818	554.7047	429.6649	299.1535	311.5441	438.7333	518.2113	550.8497	568.4378 (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	1228.4903	1189.8655	1075.0310	895.9304	691.9320	465.0201	306.0561	321.2534	502.9459	760.8462	1011.0483	1219.8258 (97)
Space heating kWh	480.0422	383.9029	341.5764	206.0990	102.0971	0.0000	0.0000	0.0000	0.0000	180.5203	331.3430	484.6326 (98a)
Space heating requirement - total per year (kWh/year)												2510.2135
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	480.0422	383.9029	341.5764	206.0990	102.0971	0.0000	0.0000	0.0000	0.0000	180.5203	331.3430	484.6326 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2510.2135
Space heating per m2												(98c) / (4) = 27.5545 (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	480.0422	383.9029	341.5764	206.0990	102.0971	0.0000	0.0000	0.0000	0.0000	180.5203	331.3430	484.6326 (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)	519.5262	415.4793	369.6714	223.0508	110.4947	0.0000	0.0000	0.0000	0.0000	195.3683	358.5963	524.4942 (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	216.0836	191.0454	203.3372	180.2486	175.5992	159.2266	158.1160	163.9985	165.3089	183.0877	193.0688	213.9672 (64)
Efficiency of water heater (217)m	86.0397	85.8450	85.4837	84.6694	83.2613	80.3000	80.3000	80.3000	80.3000	84.3512	85.5277	86.0765 (217)
Fuel for water heating, kWh/month	251.1442	222.5469	237.8667	212.8852	210.9013	198.2896	196.9066	204.2323	205.8641	217.0541	225.7384	248.5779 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.3239	25.9314	23.3484	17.1060	13.2132	10.7953	12.0535	15.6676	20.3507	26.7012	30.1589	33.2223 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-30.6657	-44.4302	-65.5740	-75.7254	-83.3297	-78.3574	-77.4171	-72.3113	-63.5058	-51.7547	-34.1474	-26.3756 (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	-13.7971	-29.3925	-59.1234	-89.8346	-119.8034	-120.7670	-119.3251	-100.5291	-73.0405	-42.3417	-18.5193	-10.8807 (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												2716.6813 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2632.0074 (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)												260.8724 (232)
Energy saving/generation technologies (Appendices M, N and O)												
PV generation												-1500.9486 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix O - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4194.6125 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2716.6813	0.2100	570.5031 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2632.0074	0.2100	552.7215 (264)
Space and water heating			1123.2246 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	260.8724	0.1443	37.6520 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-703.5943	0.1340	-94.3053
PV Unit electricity exported	-797.3543	0.1256	-100.1140
Total			-194.4193 (269)
Total CO2, kg/year			978.3865 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400 (273)

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 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	2716.6813	1.1300	3069.8499 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2632.0074	1.1300	2974.1683 (278)
Space and water heating			6044.0182 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	260.8724	1.5338	400.1348 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-703.5943	1.4953	-1052.1090
PV Unit electricity exported	-797.3543	0.4609	-367.4743
Total			-1419.5832 (283)
Total Primary energy kWh/year			5154.6706 (286)
Target Primary Energy Rate (TPER)			56.5800 (287)