

# Full SAP Calculation Printout



Property Reference	Flat 1		Issued on Date	26/07/2023	
Assessment Reference	Flat 1 - AM	Prop Type Ref			
Property	Flat 1, Pier View Hotel, 34 Oldminster Road, Sharpness, Berkeley, G13 9NA				
SAP Rating	72 C	DER	25.42	TER	14.56
Environmental	78 C	% DER < TER			-74.59
CO <sub>2</sub> Emissions (t/year)	1.96	DFEE	102.21	TFEE	49.63
Compliance Check	See BREL	% DFEE < TFEE			-105.97
% DPER < TPER	-90.88	DPER	146.43	TPER	76.71
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

Ground floor		Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	89.6900	89.6900 (1b)	x 3.2000 (2b)	= 287.0080 (1b) - (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =		287.0080 (5)

### 2. Ventilation rate

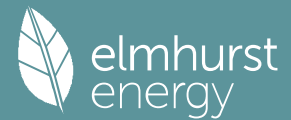
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked 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) =	0.0697 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.8197	(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) =	0.7582 (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	0.9667	0.9478	0.9288	0.8340	0.8151	0.7203	0.7203	0.7013	0.7582	0.8151	0.8530	0.8909 (22b)
Effective ac	0.9673	0.9491	0.9313	0.8478	0.8322	0.7594	0.7594	0.7459	0.7874	0.8322	0.8638	0.8968 (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			1.5700	1.4000	2.1980		(26)
New Windows (Uw = 1.40)			17.0200	1.3258	22.5644		(27)
Ground Floor			89.6900	0.2500	22.4225	110.0000	9865.9000 (28a)
External Wall	107.9000	17.0200	90.8800	0.2800	25.4464	9.0000	817.9200 (29a)
Corridor Wall	21.7600	1.5700	20.1900	0.3000	6.0570	9.0000	181.7100 (29a)
Total net area of external elements Aum(A, m <sup>2</sup> )			219.3500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)... (30) + (32) =	78.6883	(33)
Party Wall			27.1000	0.0000	0.0000	180.0000	4878.0000 (32)

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Party Ceiling		89.6900		30.0000	2690.7000 (32b)
Internal Wall		207.5300		9.0000	1867.7700 (32c)

Heat capacity  $C_m = \text{Sum}(A \times k)$  (28)... (30) + (32) + (32a)... (32e) = 20302.0000 (34)  
 Thermal mass parameter (TMP =  $C_m / \text{TFA}$ ) in kJ/m<sup>2</sup>K 226.3575 (35)  
 Thermal bridges (Default value 0.200 \* total exposed area) 43.8700 (36)  
 Point Thermal bridges (36a) = 0.0000  
 Total fabric heat loss (33) + (36) + (36a) = 122.5583 (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	91.6126	89.8941	88.2096	80.2976	78.8173	71.9261	71.9261	70.6500	74.5805	78.8173	81.8119	84.9427 (38)
Average = $\text{Sum}(39)m / 12 =$	214.1709	212.4524	210.7679	202.8559	201.3756	194.4844	194.4844	193.2083	197.1388	201.3756	204.3702	207.5010 (39)
HLP	2.3879	2.3687	2.3500	2.2617	2.2452	2.1684	2.1684	2.1542	2.1980	2.2452	2.2786	2.3135 (40)
HLP (average)												2.2617
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy													2.6215 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	41.4763	39.9681	38.4598	36.9516	35.4434	33.9352	33.9352	35.4434	36.9516	38.4598	39.9681	41.4763 (42c)	
Average daily hot water use (litres/day)	9.8532	8.5371	8.8667	7.5877	7.1570	6.2591	6.1562	6.5829	6.8348	7.8284	8.5413	9.7413 (46)	
Daily hot water use	41.4763	39.9681	38.4598	36.9516	35.4434	33.9352	33.9352	35.4434	36.9516	38.4598	39.9681	41.4763 (44)	
Energy content	65.6883	56.9140	59.1114	50.5849	47.7136	41.7272	41.0416	43.8863	45.5650	52.1897	56.9419	64.9419 (45)	
Energy content (annual)													Total = $\text{Sum}(45)m = 626.3058$
Distribution loss (46)m = 0.15 x (45)m	9.8532	8.5371	8.8667	7.5877	7.1570	6.2591	6.1562	6.5829	6.8348	7.8284	8.5413	9.7413 (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	0.1635	0.1365	0.1364	0.1122	0.1015	0.0850	0.0836	0.0933	0.1010	0.1204	0.1366	0.1616 (61)	
Total heat required for water heating calculated for each month	65.8518	57.0505	59.2478	50.6971	47.8151	41.8122	41.1252	43.9796	45.6661	52.3101	57.0784	65.1035 (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	65.8518	57.0505	59.2478	50.6971	47.8151	41.8122	41.1252	43.9796	45.6661	52.3101	57.0784	65.1035 (64)	
Total per year (kWh/year)													Total per year (kWh/year) = $\text{Sum}(64)m = 627.7373$ (64)
Electric shower(s)	70.1350	62.4909	68.2376	65.1183	66.3402	63.2822	65.3916	66.3402	65.1183	68.2376	66.9545	70.1350 (64a)	
Heat gains from water heating, kWh/month	39.4160	34.5807	36.7480	33.1271	32.4752	29.7161	30.0151	31.2006	31.4552	34.4426	35.7059	39.1673 (65)	

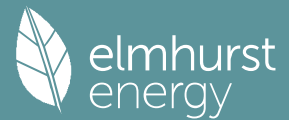
#### 5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.9131	134.9752	121.9131	125.9769	121.9131	125.9769	121.9131	125.9769	121.9131	125.9769	121.9131	125.9769 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.5063	240.9812	234.7444	221.4670	204.7067	188.9544	178.4308	175.9559	182.1927	195.4701	212.2304	227.9827 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073 (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)	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581 (71)	
Water heating gains (Table 5)	52.9785	51.4594	49.3925	46.0099	43.6495	41.2723	40.3429	41.9363	43.6878	46.2938	49.5916	52.6443 (72)	
Total internal gains	478.7197	492.7377	471.3719	458.7756	435.5911	418.5254	403.0087	402.1271	414.1792	428.9988	453.1207	467.8619 (73)	

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	1.4000	10.6334	0.6300	0.7000	0.7700	4.5496 (74)
South	1.0200	46.7521	0.6300	0.7000	0.7700	14.5738 (78)
Southwest	2.1700	36.7938	0.6300	0.7000	0.7700	24.4009 (79)
West	10.2600	19.6403	0.6300	0.7000	0.7700	61.5838 (80)
Northwest	2.1700	11.2829	0.6300	0.7000	0.7700	7.4826 (81)

Solar gains	112.5908	209.8285	327.8874	462.9772	561.8927	574.6300	547.1791	472.3063	375.2848	243.5931	138.3170	94.0222 (83)
Total gains	591.3104	702.5662	799.2593	921.7528	997.4838	993.1554	950.1878	874.4334	789.4640	672.5919	591.4376	561.8841 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.3315	26.5445	26.7567	27.8003	28.0046	28.9969	28.9969	29.1884	28.6065	28.0046	27.5943	27.1779	
alpha	2.7554	2.7696	2.7838	2.8534	2.8670	2.9331	2.9331	2.9459	2.9071	2.8670	2.8396	2.8119	
util living area	0.9941	0.9901	0.9822	0.9609	0.9158	0.8229	0.7055	0.7526	0.9020	0.9735	0.9908	0.9950 (86)	
MIT	17.8956	18.1611	18.6269	19.3373	19.9806	20.5401	20.8005	20.7512	20.3059	19.4703	18.6169	17.9237 (87)	
Th 2	19.0873	19.0988	19.1102	19.1645	19.1749	19.2234	19.2234	19.2325	19.2046	19.1749	19.1541	19.1325 (88)	
util rest of house	0.9920	0.9864	0.9751	0.9431	0.8698	0.7076	0.4930	0.5560	0.8263	0.9580	0.9867	0.9933 (89)	
MIT 2	15.6481	15.9926	16.5915	17.5150	18.3054	18.9522	19.1658	19.1480	18.7182	17.6989	16.6044	15.7063 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	16.6848	16.9928	17.5303	18.3555	19.0781	19.6846	19.9198	19.8875	19.4505	18.5160	17.5327	16.7291 (92)	
Temperature adjustment	-0.1500												
adjusted MIT	16.5348	16.8428	17.3803	18.2055	18.9281	19.5346	19.7698	19.7375	19.3005	18.3660	17.3827	16.5791 (93)	

## 8. Space heating requirement

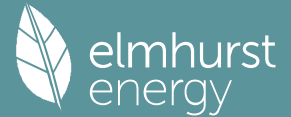
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9871	0.9792	0.9647	0.9294	0.8613	0.7328	0.5705	0.6246	0.8318	0.9473	0.9802	0.9891 (94)
Useful gains	583.7095	687.9526	771.0489	856.6391	859.1701	727.8208	542.0373	546.1327	656.7090	637.1177	579.7375	555.7499 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2620.3375	2537.2850	2293.2201	1887.6849	1455.5622	959.7046	616.4804	644.8286	1025.2276	1563.8727	2101.4723	2568.6783 (97)
Space heating kWh	1515.2513	1242.7514	1132.4954	742.3530	443.7157	0.0000	0.0000	0.0000	0.0000	689.5057	1095.6490	1497.6188 (98a)
Space heating requirement - total per year (kWh/year)												8359.3402
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	1515.2513	1242.7514	1132.4954	742.3530	443.7157	0.0000	0.0000	0.0000	0.0000	689.5057	1095.6490	1497.6188 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8359.3402
Space heating per m2												(98c) / (4) = 93.2026 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.1000 (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	1515.2513	1242.7514	1132.4954	742.3530	443.7157	0.0000	0.0000	0.0000	0.0000	689.5057	1095.6490	1497.6188 (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)	1700.6187	1394.7827	1271.0386	833.1683	497.9974	0.0000	0.0000	0.0000	0.0000	773.8560	1229.6846	1680.8291 (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	65.8518	57.0505	59.2478	50.6971	47.8151	41.8122	41.1252	43.9796	45.6661	52.3101	57.0784	65.1035 (64)	
Efficiency of water heater (217)m	88.9214	88.9118	88.8868	88.8261	88.6839	85.0000	85.0000	85.0000	85.0000	88.7980	88.8877	88.9213 (217)	
Fuel for water heating, kWh/month	74.0562	64.1653	66.6553	57.0745	53.9163	49.1908	48.3826	51.7408	53.7248	58.9091	64.2141	73.2147 (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	31.0860	24.9383	22.4542	16.4509	12.7071	10.3818	11.5919	15.0676	19.5713	25.6786	29.0039	31.9499 (232)	



# Full SAP Calculation Printout



Dwelling volume

(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 287.0080 (5)

## 2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) = 0.1045 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3545 (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) =	0.3279 (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	0.4181	0.4099	0.4017	0.3607	0.3525	0.3115	0.3115	0.3033	0.3279	0.3525	0.3689	0.3853 (22b)
Effective ac	0.5874	0.5840	0.5807	0.5651	0.5621	0.5485	0.5485	0.5460	0.5538	0.5621	0.5681	0.5742 (25)

## 3. Heat losses and heat loss parameter

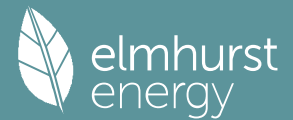
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.5700	1.0000	1.5700		(26)
TER Opening Type (Uw = 1.20)			17.0200	1.1450	19.4885		(27)
Ground Floor			89.6900	0.1300	11.6597		(28a)
External Wall	107.9000	17.0200	90.8800	0.1800	16.3584		(29a)
Corridor Wall	21.7600	1.5700	20.1900	0.1800	3.6342		(29a)
Total net area of external elements Aum(A, m2)			219.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.7108		(33)
Party Wall			27.1000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							236.3575 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							10.9675 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	63.6783 (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		55.6354	55.3139	54.9988	53.5186	53.2417	51.9526	51.9526	51.7139	52.4492	53.2417	53.8019	54.3876 (38)
Heat transfer coeff		119.3137	118.9922	118.6771	117.1970	116.9201	115.6310	115.6310	115.3922	116.1275	116.9201	117.4803	118.0660 (39)
Average = Sum(39)m / 12 =													117.1957
HLP		1.3303	1.3267	1.3232	1.3067	1.3036	1.2892	1.2892	1.2866	1.2948	1.3036	1.3098	1.3164 (40)
HLP (average)													1.3067
Days in mont		31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy													
Hot water usage for mixer showers		87.5775	86.2614	84.3435	80.6741	77.9661	74.9462	73.2297	75.1331	77.2195	80.4619	84.2102	87.2420 (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		41.4763	39.9681	38.4598	36.9516	35.4434	33.9352	33.9352	35.4434	36.9516	38.4598	39.9681	41.4763 (42c)
Average daily hot water use (litres/day)													118.4493 (43)
Daily hot water use		129.0538	126.2295	122.8034	117.6257	113.4095	108.8814	107.1649	110.5765	114.1711	118.9218	124.1783	128.7183 (44)
Energy content (annual)		204.3897	179.7491	188.7442	161.0237	152.6710	133.8824	129.6067	136.9167	140.7844	161.3757	176.9147	201.5417 (45)
Distribution loss (46)m = 0.15 x (45)m		30.6585	26.9624	28.3116	24.1536	22.9007	20.0824	19.4410	20.5375	21.1177	24.2064	26.5372	30.2313 (46)
Total = Sum(45)m													1967.6000

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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	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	49.3151	(61)
Total heat required for water heating calculated for each month	255.3486	225.7765	239.7031	210.3388	203.6299	183.1975	180.5656	187.8756	190.0994	212.3346	226.2298	252.5006	226.2298	(62)
WWHRS	-40.0368	-35.4089	-37.0781	-30.7021	-28.6133	-24.4846	-22.9504	-24.4055	-25.3327	-29.8645	-33.8328	-39.2954	-33.8328	(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	-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	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	0.0000	(63d)
Output from w/h	215.3118	190.3676	202.6250	179.6366	175.0166	158.7129	157.6151	163.4702	164.7667	182.4701	192.3969	213.2052	192.3969	(64)
12Total per year (kWh/year)														(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =														(64a)
Heat gains from water heating, kWh/month	80.6993	71.2734	75.4972	65.8692	63.5028	56.8447	55.8339	58.2645	59.1396	66.3971	71.1529	79.7523	71.1529	(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	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	131.0727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.9131	134.9752	121.9131	125.9769	121.9131	125.9769	121.9131	121.9131	125.9769	121.9131	125.9769	121.9131	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.5063	240.9812	234.7444	221.4670	204.7067	188.9544	178.4308	175.9559	182.1927	195.4701	212.2304	227.9827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	36.1073	(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)	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	-104.8581	(71)
Water heating gains (Table 5)	108.4668	106.0616	101.4747	91.4849	85.3533	78.9509	75.0456	78.3126	82.1383	89.2435	98.8235	107.1940	(72)
Total internal gains	534.2080	547.3399	523.4541	504.2507	477.2949	456.2040	437.7114	438.5034	452.6297	471.9485	502.3526	522.4117	(73)

## 6. Solar gains

[Jan]	Area m <sup>2</sup>	Solar flux Table 6a W/m <sup>2</sup>	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	1.4000	10.6334	0.6300	0.7000	0.7700	4.5496 (74)							
South	1.0200	46.7521	0.6300	0.7000	0.7700	14.5738 (78)							
Southwest	2.1700	36.7938	0.6300	0.7000	0.7700	24.4009 (79)							
West	10.2600	19.6403	0.6300	0.7000	0.7700	61.5838 (80)							
Northwest	2.1700	11.2829	0.6300	0.7000	0.7700	7.4826 (81)							
Solar gains	112.5908	209.8285	327.8874	462.9772	561.8927	574.6300	547.1791	472.3063	375.2848	243.5931	138.3170	94.0222	(83)
Total gains	646.7987	757.1684	851.3415	967.2279	1039.1876	1030.8340	984.8905	910.8097	827.9145	715.5416	640.6695	616.4339	(84)

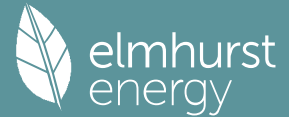
## 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, ni,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	49.3538	49.4871	49.6185	50.2452	50.3642	50.9257	50.9257	51.0310	50.7079	50.3642	50.1240	49.8754		
alpha	4.2903	4.2991	4.3079	4.3497	4.3576	4.3950	4.3950	4.4021	4.3805	4.3576	4.3416	4.3250		
util living area	0.9946	0.9887	0.9750	0.9309	0.8313	0.6612	0.5025	0.5589	0.8006	0.9566	0.9895	0.9956	(86)	
MIT	19.3706	19.5896	19.9229	20.3721	20.7288	20.9289	20.9831	20.9735	20.8317	20.3550	19.7890	19.3415	(87)	
Th 2	19.8172	19.8200	19.8227	19.8356	19.8380	19.8493	19.8493	19.8514	19.8449	19.8380	19.8331	19.8280	(88)	
util rest of house	0.9928	0.9851	0.9667	0.9073	0.7758	0.5638	0.3780	0.4307	0.7174	0.9369	0.9854	0.9942	(89)	
MIT 2	17.9433	18.2237	18.6464	19.2068	19.6118	19.8090	19.8440	19.8421	19.7307	19.2000	18.4883	17.9135	(90)	
Living area fraction	18.6016	18.8537	19.2352	19.7443	20.1270	20.3255	20.3694	20.3640	20.2385	19.7328	19.0883	18.5722	(92)	
Temperature adjustment	18.6016	18.8537	19.2352	19.7443	20.1270	20.3255	20.3694	20.3640	20.2385	19.7328	19.0883	18.5722	(93)	
adjusted MIT	18.6016	18.8537	19.2352	19.7443	20.1270	20.3255	20.3694	20.3640	20.2385	19.7328	19.0883	18.5722	(93)	

## 8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Utilisation	0.9903	0.9811	0.9613	0.9051	0.7911	0.6061	0.4356	0.4898	0.7487	0.9347	0.9819	0.9920 (94)
Useful gains	640.5053	742.8622	818.4094	875.4600	822.0679	624.8022	429.0236	446.1591	619.8329	668.8224	629.0705	611.4926 (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	1706.3828	1660.3827	1511.3751	1270.9155	985.2878	662.0504	435.8613	457.4118	712.8535	1067.8052	1408.3840	1696.8690 (97)
Space heating kWh	793.0128	616.5738	515.5665	284.7279	121.4356	0.0000	0.0000	0.0000	0.0000	296.8432	561.1057	807.5200 (98a)
Space heating requirement - total per year (kWh/year)												3996.7856
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	793.0128	616.5738	515.5665	284.7279	121.4356	0.0000	0.0000	0.0000	0.0000	296.8432	561.1057	807.5200 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3996.7856
Space heating per m2												(98c) / (4) = 44.5622 (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	793.0128	616.5738	515.5665	284.7279	121.4356	0.0000	0.0000	0.0000	0.0000	296.8432	561.1057	807.5200 (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)	858.2390	667.2877	557.9724	308.1471	131.4238	0.0000	0.0000	0.0000	0.0000	321.2589	607.2572	873.9394 (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	215.3118	190.3676	202.6250	179.6366	175.0166	158.7129	157.6151	163.4702	164.7667	182.4701	192.3969	213.2052 (64)
Efficiency of water heater (217)m	86.9124	86.7092	86.2926	85.3634	83.6133	80.3000	80.3000	80.3000	80.3000	85.4174	86.5336	86.9548 (217)
Fuel for water heating, kWh/month	247.7343	219.5472	234.8116	210.4376	209.3167	197.6499	196.2829	203.5743	205.1889	213.6217	222.3377	245.1909 (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	25.3311	20.3216	18.2973	13.4054	10.3547	8.4599	9.4459	12.2782	15.9481	20.9248	23.6345	26.0352 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-30.1031	-43.5947	-64.3449	-74.3431	-81.8683	-77.0119	-76.0448	-70.9402	-62.2336	-50.7204	-33.4950	-25.8910 (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	-13.6716	-29.0854	-58.4225	-88.6544	-118.1208	-119.0305	-117.6524	-99.2250	-72.1993	-41.9197	-18.3565	-10.7887 (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												4325.5255 (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												2605.6938 (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)												204.4368 (232)
Energy saving/generation technologies (Appendices M, N and O)												
PV generation												-1477.7177 (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												5743.9384 (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	4325.5255	0.2100	908.3604 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2605.6938	0.2100	547.1957 (264)
Space and water heating			1455.5561 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	204.4368	0.1443	29.5065 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-690.5909	0.1340	-92.5605
PV Unit electricity exported	-787.1268	0.1256	-98.8551
Total			-191.4157 (269)
Total CO2, kg/year			1305.5762 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5600 (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	4325.5255	1.1300	4887.8438 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2605.6938	1.1300	2944.4340 (278)
Space and water heating			7832.2778 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	204.4368	1.5338	313.5720 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-690.5909	1.4953	-1032.6574
PV Unit electricity exported	-787.1268	0.4610	-362.8547
Total			-1395.5121 (283)
Total Primary energy kWh/year			6880.4385 (286)
Target Primary Energy Rate (TPER)			76.7100 (287)