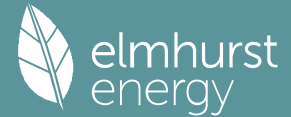


# Full SAP Calculation Printout



Property Reference	Flat 3		Issued on Date	26/07/2023	
Assessment Reference	Flat 3 - PV	Prop Type Ref			
Property	Flat 3, Pier View Hotel, 34 Oldminster Road, Sharpness, Berkeley, G13 9NA				
SAP Rating	85 B	DER	15.50	TER	11.29
Environmental	86 B	% DER < TER	-37.29		
CO <sub>2</sub> Emissions (t/year)	1.2	DFEE	69.46	TFEE	36.03
Compliance Check	See BREL				
% DPER < TPER	-48.92	DPER	88.17	TPER	59.21
Assessor Details	[REDACTED]			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	45.8900 (1b)	x 2.8000 (2b)	= 128.4920 (1b)
First floor	45.8900 (1c)	x 2.3200 (2c)	= 106.4648 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.9568 (5)

### 2. Ventilation rate

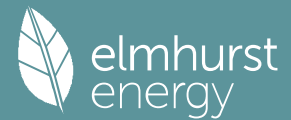
	m <sup>3</sup> per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1277 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8777 (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) = 0.8119 (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 infil rate	1.0351	1.0148	0.9945	0.8930	0.8727	0.7713	0.7713	0.7510	0.8119	0.8727	0.9133	0.9539 (22b)
Effective ac	1.0351	1.0148	0.9945	0.8988	0.8808	0.7974	0.7974	0.7820	0.8296	0.8808	0.9171	0.9550 (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			1.8300	1.4000	2.5620		(26)
New Windows (Uw = 1.40)			14.2700	1.3258	18.9186		(27)
External Wall	112.9600	14.2700	98.6900	0.2800	27.6332	9.0000	888.2100 (29a)
Corridor Wall	28.2500	1.8300	26.4200	0.3000	7.9260	9.0000	237.7800 (29a)
Stud Wall	1.0600		1.0600	0.3000	0.3180	9.0000	9.5400 (29a)
Warm Pitched Roof	15.5000		15.5000	0.1700	2.6350	9.0000	139.5000 (30)
Cold Pitched Roof	33.5000		33.5000	0.1500	5.0250	9.0000	301.5000 (30)

# Full SAP Calculation Printout



Total net area of external elements A <sub>um</sub> (A, m <sup>2</sup> )	191.2700												(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...	(30) + (32) =	65.0178										(33)
Party Wall	17.1400	0.0000	0.0000						180.0000	3085.2000			(32)
Party Floor	45.8900								40.0000	1835.6000			(32d)
Internal Wall Lower Floor	43.2700								9.0000	389.4300			(32c)
Internal Wall Upper Floor	56.8400								9.0000	511.5600			(32c)

Heat capacity C <sub>m</sub> = Sum(A x k)	(28)...	(30) + (32) + (32a)...	(32e) =	7398.3200									(34)
Thermal mass parameter (TMP = C <sub>m</sub> / TFA) in kJ/m <sup>2</sup> K				80.6093									(35)
Thermal bridges (Default value 0.200 * total exposed area)				38.2540									(36)
Point Thermal bridges													(36a) =
Total fabric heat loss													(33) + (36) + (36a) =
													103.2718 (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	
	80.2586	78.6849	77.1124	69.6862	68.2968	61.8289	61.8289	60.6311	64.3202	68.2968	71.1076	74.0461	(38)
Heat transfer coeff													
	183.5304	181.9567	180.3841	172.9580	171.5686	165.1006	165.1006	163.9029	167.5920	171.5686	174.3793	177.3178	(39)
Average = Sum(39)m / 12 =													172.9466
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.9997	1.9825	1.9654	1.8845	1.8693	1.7989	1.7989	1.7858	1.8260	1.8693	1.9000	1.9320	(40)
HLP (average)													1.8844
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

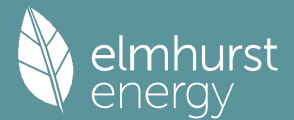
#### 4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6493 (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	41.7616	40.2430	38.7244	37.2058	35.6872	34.1686	34.1686	35.6872	37.2058	38.7244	40.2430	41.7616	41.7616 (42c)
Average daily hot water use (litres/day)													37.9651 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	41.7616	40.2430	38.7244	37.2058	35.6872	34.1686	34.1686	35.6872	37.2058	38.7244	40.2430	41.7616	(44)
Energy conte	66.1401	57.3054	59.5179	50.9328	48.0418	42.0142	41.3239	44.1882	45.8784	52.5486	57.3335	65.3885	(45)
Energy content (annual)													Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m	9.9210	8.5958	8.9277	7.6399	7.2063	6.3021	6.1986	6.6282	6.8818	7.8823	8.6000	9.8083	(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	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	0.1657	0.1384	0.1383	0.1137	0.1029	0.0861	0.0847	0.0946	0.1024	0.1221	0.1384	0.1638	(61)
Total heat required for water heating calculated for each month	66.3058	57.4438	59.6562	51.0465	48.1446	42.1004	41.4086	44.2828	45.9808	52.6707	57.4719	65.5524	(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	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	-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	66.3058	57.4438	59.6562	51.0465	48.1446	42.1004	41.4086	44.2828	45.9808	52.6707	57.4719	65.5524	(64)
													Total per year (kWh/year) = Sum(64)m =
													632.0646 (64)
12Total per year (kWh/year)													632 (64)
Electric shower(s)	70.6171	62.9204	68.7067	65.5659	66.7962	63.7171	65.8410	66.7962	65.5659	68.7067	67.4147	70.6171	(64a)
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =
													803.2650 (64a)
Heat gains from water heating, kWh/month	39.6873	34.8188	37.0009	33.3551	32.6987	29.9205	30.2216	31.4153	31.6717	34.6796	35.9517	39.4369	(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	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.2439	141.9844	128.2439	132.5187	128.2439	132.5187	128.2439	128.2439	132.5187	128.2439	132.5187	128.2439	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	242.3146	244.8291	238.4927	225.0033	207.9754	191.9715	181.2799	178.7655	185.1018	198.5912	215.6192	231.6230	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	(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)	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	(71)
Water heating gains (Table 5)	53.3431	51.8136	49.7324	46.3265	43.9498	41.5563	40.6205	42.2248	43.9884	46.6124	49.9329	53.0066	(72)
Total internal gains	489.6413	504.3667	482.2087	469.5881	445.9087	428.7862	412.8840	411.9739	424.3486	439.1872	463.8104	478.6132	(73)

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## 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	FF Access factor Table 6d	Gains W				
South			6.7000	46.7521	0.6300	0.7000	0.7700	95.7299 (78)				
West			7.5700	19.6403	0.6300	0.7000	0.7700	45.4376 (80)				
Solar gains	141.1674	245.6664	346.0928	439.2059	496.8497	494.1924	476.1548	433.8144	378.8698	274.5730	170.1278	120.0851 (83)
Total gains	630.8087	750.0330	828.3015	908.7940	942.7585	922.9786	889.0388	845.7883	803.2184	713.7602	633.9382	598.6983 (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	11.1975	11.2944	11.3928	11.8820	11.9782	12.4475	12.4475	12.5385	12.2625	11.9782	11.7852	11.5899
alpha	1.7465	1.7530	1.7595	1.7921	1.7985	1.8298	1.8298	1.8359	1.8175	1.7985	1.7857	1.7727
util living area	0.9491	0.9301	0.9057	0.8594	0.7939	0.6894	0.5799	0.6097	0.7546	0.8749	0.9310	0.9530 (86)
MIT	16.4084	16.8211	17.4875	18.4626	19.3531	20.1631	20.5802	20.5234	19.9145	18.7451	17.4713	16.4145 (87)
Th 2	19.3335	19.3450	19.3565	19.4115	19.4219	19.4708	19.4708	19.4799	19.4518	19.4219	19.4009	19.3791 (88)
util rest of house	0.9404	0.9181	0.8884	0.8313	0.7453	0.6014	0.4384	0.4755	0.6801	0.8443	0.9173	0.9450 (89)
MIT 2	14.3176	14.8247	15.6440	16.8442	17.9100	18.8491	19.2607	19.2225	18.5857	17.2084	15.6450	14.3327 (90)
Living area fraction	fLA = Living area / (4) =											0.2604 (91)
MIT	14.8621	15.3446	16.1240	17.2656	18.2858	19.1913	19.6043	19.5612	18.9317	17.6085	16.1206	14.8748 (92)
Temperature adjustment												-0.1500
adjusted MIT	14.7121	15.1946	15.9740	17.1156	18.1358	19.0413	19.4543	19.4112	18.7817	17.4585	15.9706	14.7248 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8985	0.8689	0.8333	0.7731	0.6922	0.5705	0.4366	0.4681	0.6375	0.7874	0.8691	0.9054 (94)
Useful gains	566.7720	651.7267	690.2436	702.5550	652.5849	526.5405	388.1356	395.8921	512.0482	562.0461	550.9444	542.0856 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1910.9308	1873.1684	1708.9674	1420.9578	1104.1838	733.2565	471.2421	493.5511	784.6204	1176.7068	1546.8417	1866.2375 (97)
Space heating kWh	1000.0541	820.8088	757.9306	517.2500	335.9896	0.0000	0.0000	0.0000	0.0000	457.3075	717.0461	985.1690 (98a)
Space heating requirement - total per year (kWh/year)												5591.5557
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	1000.0541	820.8088	757.9306	517.2500	335.9896	0.0000	0.0000	0.0000	0.0000	457.3075	717.0461	985.1690 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5591.5557
Space heating per m <sup>2</sup>												(98c) / (4) = 60.9235 (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	1000.0541	820.8088	757.9306	517.2500	335.9896	0.0000	0.0000	0.0000	0.0000	457.3075	717.0461	985.1690 (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)	1122.3952	921.2220	850.6516	580.5276	377.0927	0.0000	0.0000	0.0000	0.0000	513.2520	804.7656	1105.6891 (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	66.3058	57.4438	59.6562	51.0465	48.1446	42.1004	41.4086	44.2828	45.9808	52.6707	57.4719	65.5524 (64)
Efficiency of water heater (217)m	88.8336	88.8198	88.7875	88.7156	88.5646	85.0000	85.0000	85.0000	85.0000	88.6583	88.7822	85.0000 (216)
Fuel for water heating, kWh/month	74.6405	64.6746	67.1899	57.5395	54.3611	49.5298	48.7160	52.0974	54.0951	59.4086	64.7336	73.7931 (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)

# Full SAP Calculation Printout



Lighting	32.8139	26.3245	23.7023	17.3653	13.4135	10.9589	12.2362	15.9051	20.6592	27.1060	30.6161	33.7259	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-33.6326	-49.1435	-73.2650	-85.7131	-95.5885	-90.6737	-89.9599	-83.6581	-72.5808	-58.0896	-37.7257	-28.9071	(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	-13.9538	-29.8655	-60.1927	-91.4779	-121.8152	-122.4396	-120.6039	-101.3248	-73.5582	-42.6174	-18.6409	-10.9665	(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												6275.5957	(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												720.7792	(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)												264.8272	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												-1606.3939	(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												6544.0731	(238)

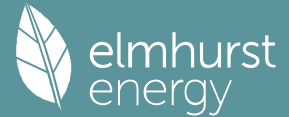
## 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6275.5957	0.2100	1317.8751 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	720.7792	0.2100	151.3636 (264)
Energy for instantaneous electric shower(s)	803.2650	0.1391	111.7519 (264a)
Space and water heating			1469.2387 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	264.8272	0.1443	38.2227 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-798.9375	0.1337	-106.8288
PV Unit electricity exported	-807.4564	0.1256	-101.4341
Total			-208.2629 (269)
Total CO2, kg/year			1422.8797 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.5000 (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	6275.5957	1.1300	7091.4231 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	720.7792	1.1300	814.4805 (278)
Energy for instantaneous electric shower(s)	803.2650	1.5143	1216.4116 (278a)
Space and water heating			7905.9036 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	264.8272	1.5338	406.2007 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-798.9375	1.4941	-1193.7187
PV Unit electricity exported	-807.4564	0.4611	-372.3276
Total			-1566.0463 (283)
Total Primary energy kWh/year			8092.5705 (286)
Dwelling Primary energy Rate (DPER)			88.1700 (287)

# Full SAP Calculation Printout



## 1. Overall dwelling characteristics

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	45.8900 (1b)	x 2.8000 (2b)	= 128.4920 (1b)
First floor	45.8900 (1c)	x 2.3200 (2c)	= 106.4648 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	91.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 234.9568 (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	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) =	0.1277 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3777 (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) =	0.3494 (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 infiltration rate	0.4454	0.4367	0.4280	0.3843	0.3756	0.3319	0.3319	0.3232	0.3494	0.3756	0.3930	0.4105 (22b)
Effective ac	0.5992	0.5954	0.5916	0.5738	0.5705	0.5551	0.5551	0.5522	0.5610	0.5705	0.5772	0.5843 (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
TER Opaque door			1.8300	1.0000	1.8300		(26)
TER Opening Type (Uw = 1.20)			14.2700	1.1450	16.3397		(27)
External Wall	112.9600	14.2700	98.6900	0.1800	17.7642		(29a)
Corridor Wall	28.2500	1.8300	26.4200	0.1800	4.7556		(29a)
Stud Wall	1.0600		1.0600	0.1800	0.1908		(29a)
Warm Pitched Roof	15.5000		15.5000	0.1100	1.7050		(30)
Cold Pitched Roof	33.5000		33.5000	0.1100	3.6850		(30)
Total net area of external elements Aum(A, m <sup>2</sup> )			191.2700				(31)
Fabric heat loss, W/K = Sum (A x U)					46.2703		(33)
Party Wall			17.1400	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K		80.6093 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		9.5635 (36)
Point Thermal bridges		(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.8338 (37)

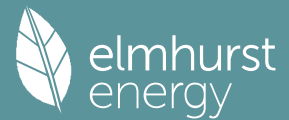
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	46.4597	46.1610	45.8683	44.4931	44.2359	43.0382	43.0382	42.8164	43.4995	44.2359	44.7563	45.3005 (38)
Heat transfer coeff	102.2935	101.9948	101.7021	100.3269	100.0697	98.8720	98.8720	98.6502	99.3333	100.0697	100.5901	101.1343 (39)
Average = Sum(39)m / 12 =												100.3257

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1146	1.1113	1.1081	1.0931	1.0903	1.0773	1.0773	1.0749	1.0823	1.0903	1.0960	1.1019 (40)
HLP (average)												1.0931
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy		2.6493 (42)
Hot water usage for mixer showers		

# Full SAP Calculation Printout



Hot water usage for baths	88.1795	86.8543	84.9233	81.2286	78.5020	75.4614	73.7331	75.6495	77.7502	81.0150	84.7890	87.8416 (42a)
Hot water usage for other uses	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)
Average daily hot water use (litres/day)	41.7616	40.2430	38.7244	37.2058	35.6872	34.1686	34.1686	35.6872	37.2058	38.7244	40.2430	41.7616 (42c)
	119.2636 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	129.9410	127.0973	123.6476	118.4344	114.1892	109.6299	107.9016	111.3367	114.9560	119.7393	125.0320	129.6032 (44)
Distribution loss (46)m = 0.15 x (45)m	30.8692	27.1477	28.5063	24.3196	23.0581	20.2204	19.5747	20.6787	21.2628	24.3728	26.7196	30.4391 (46)
Water storage loss:	0.0000											
Total storage loss	0.0000 (56)											
If cylinder contains dedicated solar storage	0.0000											
Primary loss	0.0000 (57)											
Combi loss	0.0000 (59)											
Total heat required for water heating calculated for each month	50.9589 (61)											
WWHS	256.7538	227.0122	241.0007	211.4458	204.6795	184.1179	181.4566	188.8169	191.0673	213.4441	227.4460	253.8862 (62)
PV diverter	-40.3120	-35.6522	-37.3330	-30.9132	-28.8100	-24.6529	-23.1082	-24.5732	-25.5068	-30.0697	-34.0654	-39.5655 (63a)
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 (63b)
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 (63c)
Output from w/h	216.4418	191.3600	203.6678	180.5326	175.8695	159.4650	158.3484	164.2437	165.5605	183.3743	193.3807	214.3207 (64)
	2206.5650 (64)											
12Total per year (kWh/year)	2207 (64)											
Electric shower(s)	0.0000 (64a)											
	0.0000 (64a)											
Heat gains from water heating, kWh/month	81.1665	71.6843	75.9286	66.2372	63.8518	57.1507	56.1302	58.5775	59.4614	66.7660	71.5573	80.2130 (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	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654	132.4654 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.2439	141.9844	128.2439	132.5187	128.2439	132.5187	128.2439	128.2439	132.5187	128.2439	132.5187	128.2439 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	242.3146	244.8291	238.4927	225.0033	207.9754	191.9715	181.2799	178.7655	185.1018	198.5912	215.6192	231.6230 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465	36.2465 (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)	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723	-105.9723 (71)
Water heating gains (Table 5)	109.0948	106.6731	102.0546	91.9962	85.8224	79.3760	75.4438	78.7332	82.5853	89.7393	99.3852	107.8132 (72)
Total internal gains	545.3929	559.2261	534.5309	515.2578	487.7813	466.6058	447.7073	448.4823	462.9455	482.3141	513.2627	533.4198 (73)

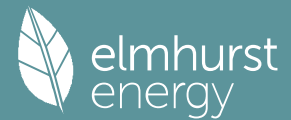
## 6. Solar gains

[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					
South		6.7000	46.7521	0.6300	0.7000	0.7700	95.7299 (78)					
West		7.5700	19.6403	0.6300	0.7000	0.7700	45.4376 (80)					
Solar gains	141.1674	245.6664	346.0928	439.2059	496.8497	494.1924	476.1548	433.8144	378.8698	274.5730	170.1278	120.0851 (83)
Total gains	686.5604	804.8925	880.6236	954.4637	984.6310	960.7982	923.8621	882.2967	841.8152	756.8871	683.3905	653.5049 (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, n <sub>l,m</sub> (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	20.0901	20.1490	20.2070	20.4839	20.5366	20.7854	20.7854	20.8321	20.6888	20.5366	20.4303	20.3204
alpha	2.3393	2.3433	2.3471	2.3656	2.3691	2.3857	2.3857	2.3888	2.3793	2.3691	2.3620	2.3547
util living area	0.9256	0.8944	0.8539	0.7819	0.6831	0.5489	0.4261	0.4573	0.6289	0.8051	0.8964	0.9324 (86)
MIT	18.2635	18.6446	19.1518	19.7969	20.3354	20.7271	20.8928	20.8696	20.5970	19.8890	18.9813	18.2064 (87)
Th 2	19.9890	19.9916	19.9942	20.0065	20.0087	20.0194	20.0194	20.0214	20.0153	20.0087	20.0041	19.9993 (88)
util rest of house	0.9166	0.8821	0.8365	0.7551	0.6418	0.4866	0.3441	0.3758	0.5706	0.7755	0.8823	0.9242 (89)
MIT 2	16.7959	17.2738	17.9080	18.7073	19.3493	19.7925	19.9525	19.9359	19.6597	18.8368	17.7123	16.7299 (90)
Living area fraction	FLA = Living area / (4) = 0.2604 (91)											

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MIT	17.1780	17.6308	18.2319	18.9910	19.6061	20.0359	20.1974	20.1790	19.9038	19.1108	18.0427	17.1144 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1780	17.6308	18.2319	18.9910	19.6061	20.0359	20.1974	20.1790	19.9038	19.1108	18.0427	17.1144 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8824	0.8447	0.7988	0.7233	0.6232	0.4877	0.3597	0.3896	0.5633	0.7434	0.8460	0.8915 (94)
Useful gains	605.8202	679.8538	703.4331	690.3591	613.6258	468.5959	332.3186	343.7371	474.2341	562.7035	578.1528	582.6145 (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	1317.3399	1298.4723	1193.1569	1012.4035	791.1634	537.4567	355.6771	372.8010	576.5082	851.6754	1100.7312	1306.0872 (97)
Space heating kWh	529.3707	415.7117	364.3545	231.8720	132.0879	0.0000	0.0000	0.0000	0.0000	214.9951	376.2564	538.2637 (98a)
Space heating requirement - total per year (kWh/year)												2802.9120
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	529.3707	415.7117	364.3545	231.8720	132.0879	0.0000	0.0000	0.0000	0.0000	214.9951	376.2564	538.2637 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2802.9120
Space heating per m2										(98c) / (4) =		30.5395 (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	529.3707	415.7117	364.3545	231.8720	132.0879	0.0000	0.0000	0.0000	0.0000	214.9951	376.2564	538.2637 (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)	572.9120	449.9044	394.3231	250.9437	142.9523	0.0000	0.0000	0.0000	0.0000	232.6786	407.2039	582.5365 (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	216.4418	191.3600	203.6678	180.5326	175.8695	159.4650	158.3484	164.2437	165.5605	183.3743	193.3807	214.3207 (64)
Efficiency of water heater	86.2202	85.9968	85.6124	84.9188	83.7761	80.3000	80.3000	80.3000	80.3000	84.7233	85.7812	80.3000 (216)
Fuel for water heating, kWh/month	251.0338	222.5199	237.8951	212.5945	209.9281	198.5865	197.1960	204.5376	206.1774	216.4392	225.4348	248.4335 (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	26.6466	21.3769	19.2475	14.1015	10.8924	8.8992	9.9364	12.9158	16.7763	22.0114	24.8618	27.3871 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-30.7726	-44.5439	-65.7104	-75.8728	-83.5060	-78.5323	-77.5497	-72.3741	-63.5293	-51.8121	-34.2347	-26.4695 (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)	-14.0220	-29.8299	-59.9178	-90.9229	-121.1434	-122.0784	-120.6611	-101.7564	-74.0362	-42.9867	-18.8250	-11.0649 (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												3033.4545 (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												2630.7766 (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)												215.0530 (232)
Energy saving/generation technologies (Appendices M, N and O)												
PV generation												-1512.1521 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

# Full SAP Calculation Printout



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	4453.1319 (238)

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 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	3033.4545	0.2100	637.0255 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2630.7766	0.2100	552.4631 (264)
Space and water heating			1189.4885 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	215.0530	0.1443	31.0388 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-704.9074	0.1340	-94.4880
PV Unit electricity exported	-807.2448	0.1256	-101.3822
Total			-195.8702 (269)
Total CO2, kg/year			1036.5864 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2900 (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	3033.4545	1.1300	3427.8036 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2630.7766	1.1300	2972.7775 (278)
Space and water heating			6400.5811 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	215.0530	1.5338	329.8554 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-704.9074	1.4954	-1054.0976
PV Unit electricity exported	-807.2448	0.4610	-372.1303
Total			-1426.2279 (283)
Total Primary energy kWh/year			5434.3095 (286)
Target Primary Energy Rate (TPER)			59.2100 (287)