

# Full SAP Calculation Printout



Property Reference	1 LEAN Gilbert Road		Issued on Date	12/03/2024	
Assessment Reference	Gilbert Road	Prop Type Ref			
Property					
SAP Rating	80 C	DER	26.81	TER	18.53
Environmental	84 B	% DER < TER	-44.68		
CO <sub>2</sub> Emissions (t/year)	0.9	DFEE	75.04	TFEE	41.97
Compliance Check	See BREL	% DFEE < TFEE	-78.79		
% DPER < TPER	-49.22	DPER	147.52	TPER	98.86
Assessor Details	Mr. Neil Ingham			Assessor ID	AV35-0001
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			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		88.1250 (1b) - (3b)
Dwelling volume			88.1250 (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)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2270 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4770 (18)
Number of sides sheltered		2 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4054 (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												
Effective ac	0.5169	0.5068	0.4966	0.4459	0.4358	0.3851	0.3851	0.3750	0.4054	0.4358	0.4561	0.4764 (22b)
	0.6336	0.6284	0.6233	0.5994	0.5950	0.5742	0.5742	0.5703	0.5822	0.5950	0.6040	0.6135 (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
G (Uw = 1.10)			4.9100	1.0536	5.1734		(27)
DOOR			2.0000	1.1000	2.2000		(26)
GF			37.5000	0.1400	5.2500	110.0000	4125.0000 (28a)
EW	47.8100	4.9100	42.9000	0.2600	11.1540	9.0000	386.1000 (29a)
SW	25.8500	2.0000	23.8500	0.2500	5.9625	9.0000	214.6500 (29a)
Total net area of external elements Aum(A, m <sup>2</sup> )			111.1600				(31)
Fabric heat loss, W/K = Sum (A x U)					29.7399		(33)
Party Wall 1			2.4400	0.0000	0.0000	180.0000	439.2000 (32)
Party Ceiling 1			37.5000			20.0000	750.0000 (32b)
IS			54.8900			9.0000	494.0100 (32c)
IF			221.3100			18.0000	3983.5800 (32d)
IC			221.3100			9.0000	1991.7900 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12384.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K		330.2488 (35)
Thermal bridges (Default value 0.200 * total exposed area)		22.2320 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	51.9719 (37)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.4256	18.2747	18.1269	17.4323	17.3024	16.6974	16.6974	16.5854	16.9305	17.3024	17.5653	17.8401	(38)
Heat transfer coeff	70.3975	70.2466	70.0987	69.4042	69.2742	68.6693	68.6693	68.5573	68.9023	69.2742	69.5371	69.8120	(39)
Average = Sum(39)m / 12 =												69.4036	
HLP	1.8773	1.8732	1.8693	1.8508	1.8473	1.8312	1.8312	1.8282	1.8374	1.8473	1.8543	1.8617	(40)
HLP (average)												1.8508	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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

Assumed occupancy													1.3416	(42)
Hot water usage for mixer showers														
46.7135	46.0115	44.9885	43.0312	41.5868	39.9760	39.0604	40.0756	41.1885	42.9180	44.9173	46.5345	46.5345	(42a)	
Hot water usage for baths														
20.2116	19.9114	19.4887	18.7093	18.1257	17.4786	17.1290	17.5488	18.0058	18.6982	19.4937	20.1432	20.1432	(42b)	
Hot water usage for other uses														
28.3692	27.3376	26.3060	25.2744	24.2428	23.2112	23.2112	24.2428	25.2744	26.3060	27.3376	28.3692	28.3692	(42c)	
Average daily hot water use (litres/day)													87.5978	(43)
Daily hot water use														
95.2943	93.2605	90.7832	87.0149	83.9553	80.6658	79.4007	81.8672	84.4688	87.9223	91.7487	95.0469	95.0469	(44)	
Energy conte	150.9228	132.8017	139.5304	119.1191	113.0200	99.1880	96.0282	101.3687	104.1584	119.3097	130.7128	148.8205	(45)	
Energy content (annual)													1454.9803	
Distribution loss (46)m = 0.15 x (45)m														
22.6384	19.9202	20.9296	17.8679	16.9530	14.8782	14.4042	15.2053	15.6238	17.8965	19.6069	22.3231	22.3231	(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	(59)	
Combi loss	48.5609	42.9254	46.2621	42.9115	42.7827	39.7804	40.4617	41.7186	41.6558	44.8042	45.2459	48.4349	(61)	
Total heat required for water heating calculated for each month														
199.4837	175.7270	185.7925	162.0305	155.8027	138.9684	136.4899	143.0874	145.8142	164.1140	175.9587	197.2554	197.2554	(62)	
WWHRS	-36.0648	-31.8960	-33.3997	-27.6562	-25.7746	-22.0555	-20.6735	-21.9842	-22.8195	-26.9017	-30.4763	-35.3969	(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	163.4189	143.8310	152.3928	134.3743	130.0281	116.9128	115.8164	121.1032	122.9948	137.2123	145.4824	161.8585	(64)	
12Total per year (kWh/year)													1645.4255	(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	62.3221	54.8879	57.9594	50.3350	48.2748	42.9251	42.0448	44.1348	45.0466	50.8715	54.7735	61.5916	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	64.8112	71.7552	64.8112	66.9715	64.8112	66.9715	64.8112	64.8112	66.9715	64.8112	66.9715	64.8112	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	(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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	(71)
Water heating gains (Table 5)	83.7662	81.6784	77.9024	69.9097	64.8855	59.6182	56.5118	59.3209	62.5648	68.3757	76.0743	82.7843	(72)
Total internal gains	310.0025	316.0552	302.3201	290.0690	274.7820	261.0599	250.7058	252.3184	260.7377	273.8070	291.7684	303.9332	(73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
North	1.8700	10.6334	0.6300	0.6300	0.7700	5.4692	(74)						
South	3.0400	46.7521	0.6300	0.6300	0.7700	39.0921	(78)						
Solar gains	44.5613	74.4748	99.3141	120.7013	134.4801	133.5755	128.7246	118.1815	106.5463	81.4963	53.0845	38.3386	(83)
Total gains	354.5638	390.5300	401.6342	410.7703	409.2621	394.6355	379.4304	370.4999	367.2840	355.3033	344.8528	342.2718	(84)

#### 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	48.8667	48.9716	49.0749	49.5660	49.6590	50.0965	50.0965	50.1783	49.9271	49.6590	49.4713	49.2765		
alpha	4.2578	4.2648	4.2717	4.3044	4.3106	4.3398	4.3398	4.3452	4.3285	4.3106	4.2981	4.2851		
util living area	0.9957	0.9929	0.9885	0.9759	0.9433	0.8537	0.7105	0.7423	0.9004	0.9754	0.9923	0.9964	(86)	
MIT	19.6552	19.7775	19.9686	20.2470	20.5274	20.7691	20.8781	20.8660	20.7036	20.3477	19.9595	19.6387	(87)	
Th 2	19.4164	19.4192	19.4219	19.4347	19.4371	19.4483	19.4483	19.4503	19.4371	19.4322	19.4322	19.4272	(88)	
util rest of house	0.9938	0.9896	0.9825	0.9616	0.9029	0.7379	0.5010	0.5429	0.8134	0.9574	0.9880	0.9947	(89)	

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MIT 2	17.9107	18.0684	18.3135	18.6730	19.0134	19.2736	19.3459	19.3431	19.2137	18.8031	18.3111	17.8976 (90)
Living area fraction									FLA = Living area / (4) =			0.3067 (91)
MIT	18.4457	18.5925	18.8211	19.1557	19.4777	19.7322	19.8158	19.8102	19.6706	19.2768	18.8166	18.4316 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2957	18.4425	18.6711	19.0057	19.3277	19.5822	19.6658	19.6602	19.5206	19.1268	18.6666	18.2816 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9917	0.9867	0.9784	0.9560	0.8991	0.7506	0.5348	0.5747	0.8191	0.9522	0.9848	0.9929 (94)
Useful gains	351.6252	385.3170	392.9640	392.6981	367.9518	296.2043	202.9257	212.9341	300.8318	338.3345	339.6219	339.8358 (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												
Space heating	985.2584	951.3171	853.1753	701.3797	528.4031	342.1243	210.5232	223.5073	373.4906	590.6865	804.3107	983.0629 (97)
Space heating kWh												
Space heating requirement - total per year (kWh/year)	471.4231	380.3520	342.3972	222.2507	119.3758	0.0000	0.0000	0.0000	0.0000	187.7499	334.5759	478.5609 (98a)
Solar heating kWh												
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh												
Space heating requirement after solar contribution - total per year (kWh/year)	471.4231	380.3520	342.3972	222.2507	119.3758	0.0000	0.0000	0.0000	0.0000	187.7499	334.5759	478.5609 (98c)
Space heating per m2												2536.6855 (99)
										(98c) / (4) =		67.6449 (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 %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	471.4231	380.3520	342.3972	222.2507	119.3758	0.0000	0.0000	0.0000	0.0000	187.7499	334.5759	478.5609 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	510.7509	412.0824	370.9612	240.7917	129.3345	0.0000	0.0000	0.0000	0.0000	203.4126	362.4874	518.4842 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	163.4189	143.8310	152.3928	134.3743	130.0281	116.9128	115.8164	121.1032	122.9948	137.2123	145.4824	161.8585 (64)
Efficiency of water heater (217)m	88.7225	88.4963	88.0519	87.1559	85.3313	79.8000	79.8000	79.8000	79.8000	86.5740	88.1170	79.8000 (216)
Fuel for water heating, kWh/month	184.1910	162.5276	173.0715	154.1769	152.3802	146.5073	145.1333	151.7583	154.1288	158.4914	165.1013	182.3038 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	14.8372	11.9029	10.7173	7.8519	6.0651	4.9552	5.5327	7.1917	9.3413	12.2562	13.8434	15.2495 (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												2748.3050 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												1929.7715 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												119.7444 (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												4838.8209 (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	2748.3050	0.2100	577.1441 (261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1929.7715	0.2100	405.2520 (264)
Space and water heating			982.3961 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	119.7444	0.1443	17.2828 (268)
Total CO2, kg/year			1005.3661 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			26.8100 (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	2748.3050	1.1300	3105.5847 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1929.7715	1.1300	2180.6418 (278)
Space and water heating			5286.2265 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	119.7444	1.5338	183.6679 (282)
Total Primary energy kWh/year			5531.9192 (286)
Dwelling Primary energy Rate (DPER)			147.5200 (287)

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 SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)  
 CALCULATION OF TARGET EMISSIONS  
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 1. Overall dwelling characteristics  
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	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	37.5000 (1b)	2.3500 (2b)	88.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		88.1250 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 88.1250 (5)

-----  
 2. Ventilation rate  
 -----

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2270 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4770 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4054 (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	0.5169	0.5068	0.4966	0.4459	0.4358	0.3851	0.3851	0.3750	0.4054	0.4358	0.4561	0.4764 (22b)
Effective ac	0.6336	0.6284	0.6233	0.5994	0.5950	0.5742	0.5742	0.5703	0.5822	0.5950	0.6040	0.6135 (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			2.0000	1.0000	2.0000		(26)
TER Opening Type (Uw = 1.20)			4.9100	1.1450	5.6221		(27)
GF			37.5000	0.1300	4.8750		(28a)
EW	47.8100	4.9100	42.9000	0.1800	7.7220		(29a)
SW	25.8500	2.0000	23.8500	0.1800	4.2930		(29a)
Total net area of external elements Aum(A, m2)			111.1600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 24.5121		(33)
Party Wall 1			2.4400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							340.2488 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							5.5580 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	30.0701 (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)												
(38)m	18.4256	18.2747	18.1269	17.4323	17.3024	16.6974	16.6974	16.5854	16.9305	17.3024	17.5653	17.8401 (38)
Heat transfer coeff	48.4957	48.3449	48.1970	47.5025	47.3725	46.7676	46.7676	46.6556	47.0006	47.3725	47.6354	47.9102 (39)
Average = Sum(39)m / 12 =												47.5018

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2932	1.2892	1.2853	1.2667	1.2633	1.2471	1.2471	1.2441	1.2533	1.2633	1.2703	1.2776 (40)
HLP (average)												1.2667
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy												1.3416 (42)
Hot water usage for mixer showers	46.7135	46.0115	44.9885	43.0312	41.5868	39.9760	39.0604	40.0756	41.1885	42.9180	44.9173	46.5345 (42a)
Hot water usage for baths	20.2116	19.9114	19.4887	18.7093	18.1257	17.4786	17.1290	17.5488	18.0058	18.6982	19.4937	20.1432 (42b)
Hot water usage for other uses	28.3692	27.3376	26.3060	25.2744	24.2428	23.2112	23.2112	24.2428	25.2744	26.3060	27.3376	28.3692 (42c)
Average daily hot water use (litres/day)												87.5978 (43)
Daily hot water use	95.2943	93.2605	90.7832	87.0149	83.9553	80.6658	79.4007	81.8672	84.4688	87.9223	91.7487	95.0469 (44)
Energy content (annual)	150.9228	132.8017	139.5304	119.1191	113.0200	99.1880	96.0282	101.3687	104.1584	119.3097	130.7128	148.8205 (45)
Distribution loss (46)m = 0.15 x (45)m	22.6384	19.9202	20.9296	17.8679	16.9530	14.8782	14.4042	15.2053	15.6238	17.8965	19.6069	22.3231 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	48.5609	42.9254	46.2621	42.9115	42.7827	39.7804	40.4617	41.7186	41.6558	44.8042	45.2459	48.4349 (61)
Total heat required for water heating calculated for each month	199.4837	175.7270	185.7925	162.0305	155.8027	138.9684	136.4899	143.0874	145.8142	164.1140	175.9587	197.2554 (62)
WWHRS	-21.3554	-18.8869	-19.7773	-16.3764	-15.2622	-13.0600	-12.2416	-13.0178	-13.5124	-15.9296	-18.0463	-20.9600 (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	178.1283	156.8401	166.0152	145.6541	140.5405	125.9084	124.2483	130.0696	132.3019	148.1844	157.9124	176.2955 (64)
12Total per year (kWh/year)												1782.0986 (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	62.3221	54.8879	57.9594	50.3350	48.2748	42.9251	42.0448	44.1348	45.0466	50.8715	54.7735	61.5916 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3155	70.0993	63.3155	65.4260	63.3155	65.4260	63.3155	63.3155	65.4260	63.3155	65.4260	63.3155 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.9462	102.5987	110.2139 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080 (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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637 (71)
Water heating gains (Table 5)	83.7662	81.6784	77.9024	69.9097	64.8855	59.6182	56.5118	59.3209	62.5648	68.3757	76.0743	82.7843 (72)
Total internal gains	308.5068	314.3993	300.8244	288.5235	273.2864	259.5144	249.2101	250.8228	259.1922	272.3113	290.2228	302.4375 (73)

## 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access Factor Table 6d	Gains W						
North	1.8700	10.6334	0.6300	0.7000	0.7700	6.0769 (74)						
South	3.0400	46.7521	0.6300	0.7000	0.7700	43.4356 (78)						
Solar gains	49.5126	82.7497	110.3491	134.1125	149.4223	148.4173	143.0273	131.3127	118.3848	90.5514	58.9827	42.5984 (83)
Total gains	358.0194	397.1490	411.1734	422.6360	422.7086	407.9317	392.2374	382.1355	377.5769	362.8628	349.2056	345.0360 (84)

## 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	73.0839	73.3120	73.5369	74.6121	74.8168	75.7845	75.7845	75.9665	75.4088	74.8168	74.4039	73.9771
alpha	5.8723	5.8875	5.9025	5.9741	5.9878	6.0523	6.0523	6.0644	6.0273	5.9878	5.9603	5.9318
util living area	0.9954	0.9906	0.9815	0.9522	0.8740	0.6999	0.5195	0.5540	0.7851	0.9521	0.9894	0.9962 (86)
MIT	20.0115	20.1605	20.3557	20.6230	20.8443	20.9698	20.9956	20.9936	20.9389	20.6779	20.3077	19.9926 (87)
Th 2	19.8461	19.8493	19.8524	19.8670	19.8697	19.8825	19.8825	19.8848	19.8776	19.8697	19.8642	19.8584 (88)
util rest of house	0.9933	0.9865	0.9731	0.9295	0.8165	0.5938	0.3906	0.4241	0.6885	0.9247	0.9840	0.9946 (89)
MIT 2	18.7322	18.9232	19.1708	19.5073	19.7521	19.8689	19.8816	19.8834	19.8449	19.5788	19.1223	18.7175 (90)
Living area fraction	19.1245	19.3026	19.5342	19.8495	20.0871	20.2065	20.2232	20.2239	20.1804	19.9159	19.4858	19.1085 (91)
Temperature adjustment												0.0000
adjusted MIT	19.1245	19.3026	19.5342	19.8495	20.0871	20.2065	20.2232	20.2239	20.1804	19.9159	19.4858	19.1085 (93)

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## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9916	0.9839	0.9701	0.9291	0.8290	0.6262	0.4305	0.4644	0.7169	0.9261	0.9816	0.9931	(94)
Useful gains	354.9977	390.7571	398.8743	392.6640	350.4421	255.4488	168.8488	177.4619	270.6875	336.0553	342.7828	342.6390	(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	718.9240	696.2933	628.2078	520.1266	397.3157	262.2022	169.4492	178.4039	285.7834	441.3152	590.0044	714.2717	(97)
Space heating kWh	270.7612	205.3203	170.6241	91.7731	34.8739	0.0000	0.0000	0.0000	0.0000	78.3134	177.9995	276.4947	(98a)
Space heating requirement - total per year (kWh/year)												1306.1603	
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	270.7612	205.3203	170.6241	91.7731	34.8739	0.0000	0.0000	0.0000	0.0000	78.3134	177.9995	276.4947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1306.1603	
Space heating per m2												34.8309	(99)

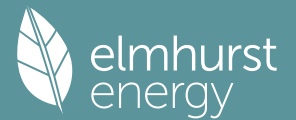
## 9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.4000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	270.7612	205.3203	170.6241	91.7731	34.8739	0.0000	0.0000	0.0000	0.0000	78.3134	177.9995	276.4947	(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)	293.0316	222.2082	184.6581	99.3215	37.7423	0.0000	0.0000	0.0000	0.0000	84.7548	192.6402	299.2367	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	178.1283	156.8401	166.0152	145.6541	140.5405	125.9084	124.2483	130.0696	132.3019	148.1844	157.9124	176.2955	(64)	
Efficiency of water heater (217)m	85.2759	84.9595	84.4402	83.4192	81.8746	80.3000	80.3000	80.3000	80.3000	83.0788	84.6387	85.3413	(216)	
Fuel for water heating, kWh/month	208.8847	184.6057	196.6068	174.6050	171.6532	156.7975	154.7301	161.9796	164.7595	178.3661	186.5724	206.5769	(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	13.1557	10.5540	9.5027	6.9621	5.3777	4.3936	4.9057	6.3767	8.2826	10.8673	12.2746	13.5213	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.0847	-19.2169	-28.7748	-33.7727	-37.6958	-35.7004	-35.3143	-32.7328	-28.3518	-22.6485	-14.6738	-11.2280	(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	-5.2177	-11.1711	-22.5550	-34.3777	-45.9210	-46.2662	-45.6718	-38.4145	-27.8555	-16.0849	-7.0057	-4.1080	(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													1413.5934	(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													2146.1374	(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)													106.1741	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-617.8438	(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													3134.0611	(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	1413.5934	0.2100	296.8546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2146.1374	0.2100	450.6889	(264)
Space and water heating			747.5435	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	106.1741	0.1443	15.3242	(268)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-313.1945	0.1337	-41.8704
PV Unit electricity exported	-304.6493	0.1255	-38.2316
Total			-80.1020 (269)
Total CO2, kg/year			694.6949 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.5300 (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	1413.5934	1.1300	1597.3606 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2146.1374	1.1300	2425.1353 (278)
Space and water heating			4022.4959 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	106.1741	1.5338	162.8533 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-313.1945	1.4940	-467.9245
PV Unit electricity exported	-304.6493	0.4606	-140.3310
Total			-608.2556 (283)
Total Primary energy kWh/year			3707.1944 (286)
Target Primary Energy Rate (TPER)			98.8600 (287)