

Full SAP Calculation Printout



Property Reference	Flat 4_Copy			Issued on Date	22/11/2023
Assessment Reference	001_Copy	Prop Type Ref	118 Malden Road		
Property					
SAP Rating	81 B	DER	11.33	TER	12.65
Environmental	91 B	% DER < TER			10.43
CO ₂ Emissions (t/year)	0.76	DFEE	33.07	TFEE	33.65
Compliance Check	See BREL	% DFEE < TFEE			1.74
% DPER < TPER	-7.75	DPER	71.69	TPER	66.53
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
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 ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9500 (1b)	x 2.5000 (2b)	= 102.3750 (1b) - (3b)
First floor	33.4100 (1c)	x 2.7000 (2c)	= 90.2070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 192.5820 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

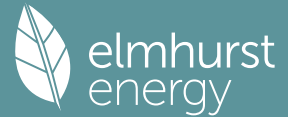
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.1000 (23c)
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front (Uw = 1.20)			14.0000	1.1450	16.0305		(27)
External Walls	63.4000	14.0000	49.4000	0.1800	8.8920	70.0000	3458.0001 (29a)
Dormer	13.2000		13.2000	0.1800	2.3760	9.0000	118.8000 (29a)
Mansard Walls	7.2000		7.2000	0.1800	1.2960	9.0000	64.8000 (29a)
Sloped C	35.0000		35.0000	0.1200	4.2000	9.0000	315.0000 (30)
Flat Roof	7.5400		7.5400	0.1200	0.9048	9.0000	67.8600 (30)
Total net area of external elements Aum(A, m ²)			126.3400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.6993		(33)
Party Floor 1			40.9500			40.0000	1638.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5662.4601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							76.1493 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	8.4000	0.0300	0.2520	
E3 Sill	8.4000	0.0400	0.3360	
E4 Jamb	10.0000	0.0500	0.5000	
E18 Party wall between dwellings	10.0000	0.0600	0.6000	
E7 Party floor between dwellings (in blocks of flats)	36.6000	0.0700	2.5620	
E16 Corner (normal)	10.0000	0.0900	0.9000	
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000	
E13 Gable (insulation at rafter level)	6.1300	0.0400	0.2452	
P4 Party wall - Roof (insulation at ceiling level)	6.1300	0.4800	2.9424	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.7376 (36)
Point Thermal Bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 42.4369 (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	16.6546	16.4520	16.2495	15.2366	15.0340	14.0212	14.0212	13.8186	14.4263	15.0340	15.4392	15.8443	(38)
Average = Sum(39)m / 12 =	59.0915	58.8890	58.6864	57.6735	57.4710	56.4581	56.4581	56.2555	56.8633	57.4710	57.8761	58.2813	(39)
												57.6229	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7947	0.7919	0.7892	0.7756	0.7729	0.7593	0.7593	0.7565	0.7647	0.7729	0.7783	0.7838	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3472 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	73.2964	72.2078	70.6749	67.8485	65.7321	63.3854	62.1178	63.6400	65.2974	67.8084	70.6931	73.0486	(42b)
Hot water usage for other uses	38.6673	37.2612	35.8551	34.4490	33.0430	31.6369	31.6369	33.0430	34.4490	35.8551	37.2612	38.6673	(42c)
Average daily hot water use (litres/day)												103.1094	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	111.9637	109.4690	106.5300	102.2975	98.7751	95.0222	93.7547	96.6829	99.7464	103.6636	107.9543	111.7159	(44)
Energy content (annual)	177.3231	155.8824	163.7327	140.0402	132.9702	116.8409	113.3881	119.7137	122.9973	140.6705	153.8007	174.9201	(45)
Distribution loss (46)m = 0.15 x (45)m	26.5985	23.3824	24.5599	21.0060	19.9455	17.5261	17.0082	17.9570	18.4496	21.1006	23.0701	26.2380	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	228.2820	201.9098	214.6916	189.3553	183.9291	166.1560	164.3470	170.6726	172.3124	191.6294	203.1157	225.8790	(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	228.2820	201.9098	214.6916	189.3553	183.9291	166.1560	164.3470	170.6726	172.3124	191.6294	203.1157	225.8790	(64)
12Total per year (kWh/year)												2312.2799	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	71.6997	63.3378	67.1808	58.8921	56.9523	51.1784	50.4413	52.5445	53.2254	59.5127	63.4675	70.9006	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

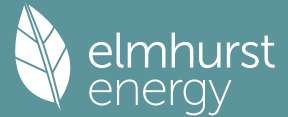
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	106.0519	117.4146	106.0519	109.5870	106.0519	109.5870	106.0519	106.0519	109.5870	106.0519	109.5870	106.0519	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	207.2521	209.4027	203.9832	192.4457	177.8817	164.1935	155.0490	152.8984	158.3179	169.8554	184.4194	198.1076	(68)
Pumps, fans	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	(71)
Total internal gains	96.3705	94.2526	90.2968	81.7946	76.5488	71.0811	67.7974	70.6244	73.9241	79.9901	88.1493	95.2966	(72)
	470.8820	482.2774	461.5394	445.0348	421.6899	403.0691	387.1058	387.7821	400.0365	417.1049	443.3632	460.6635	(73)

6. Solar gains

[Jan]												Gains
				Area	Solar flux		g	FF		Access		W
				m2	Table 6a	Specific data	or Table 6b	Specific data	or Table 6c	factor	Table 6d	
					W/m2							
North				8.4000	10.6334	0.7200		0.7000		0.7700		31.1971 (74)
South				5.6000	46.7521	0.7200		0.7000		0.7700		91.4434 (78)
Solar gains	122.6406	209.3802	292.0765	378.3364	443.8863	450.8909	430.3555	378.9876	321.0853	232.5001	146.8774	105.0230 (83)
Total gains	593.5226	691.6576	753.6160	823.3712	865.5762	853.9600	817.4613	766.7697	721.1218	649.6051	590.2405	565.6866 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.6181	26.7097	26.8019	27.2726	27.3687	27.8597	27.8597	27.9600	27.6612	27.3687	27.1771	26.9882	
alpha	2.7745	2.7806	2.7868	2.8182	2.8246	2.8573	2.8573	2.8640	2.8441	2.8246	2.8118	2.7992	
util living area	0.8860	0.8384	0.7789	0.6744	0.5456	0.4014	0.2968	0.3274	0.4955	0.7071	0.8391	0.8962 (86)	
MIT	19.5968	19.8558	20.1478	20.4878	20.7151	20.8398	20.8761	20.8707	20.7924	20.4993	20.0170	19.5595 (87)	
Th 2	20.2580	20.2603	20.2627	20.2745	20.2769	20.2888	20.2888	20.2912	20.2840	20.2769	20.2722	20.2674 (88)	
util rest of house	0.8758	0.8249	0.7609	0.6496	0.5129	0.3614	0.2509	0.2798	0.4530	0.6788	0.8235	0.8867 (89)	
MIT 2	18.5934	18.9154	19.2763	19.6949	19.9596	20.1051	20.1396	20.1378	20.0546	19.7188	19.1303	18.5541 (90)	
Living area fraction	19.0319	19.3264	19.6572	20.0414	20.2898	20.4262	20.4615	20.4581	fLA = Living area / (4) =				0.4371 (91)
MIT	19.0319	19.3264	19.6572	20.0414	20.2898	20.4262	20.4615	20.4581	20.3771	20.0599	19.5178	18.9935 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.0319	19.3264	19.6572	20.0414	20.2898	20.4262	20.4615	20.4581	20.3771	20.0599	19.5178	18.9935 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8562	0.8058	0.7448	0.6412	0.5135	0.3693	0.2622	0.2912	0.4587	0.6698	0.8054	0.8676 (94)
Useful gains	508.1598	557.3656	561.2908	527.9228	444.5014	315.3518	214.3267	223.2568	330.7908	435.0831	475.3657	490.7844 (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	870.5334	849.5583	772.1468	642.5664	493.6657	328.9379	218.0110	228.2927	356.9351	543.6706	718.6959	862.1835 (97)
Space heating kWh	269.6059	196.3534	156.8769	82.5434	36.5782	0.0000	0.0000	0.0000	0.0000	80.7891	175.1978	276.3210 (98a)
Space heating requirement - total per year (kWh/year)												1274.2658
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	269.6059	196.3534	156.8769	82.5434	36.5782	0.0000	0.0000	0.0000	0.0000	80.7891	175.1978	276.3210 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1274.2658
Space heating per m2										(98c) / (4) =		17.1364 (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 %)													90.0000 (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	269.6059	196.3534	156.8769	82.5434	36.5782	0.0000	0.0000	0.0000	0.0000	80.7891	175.1978	276.3210 (98)	
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000 (210)	
Space heating fuel (main heating system)	299.5621	218.1705	174.3077	91.7149	40.6425	0.0000	0.0000	0.0000	0.0000	89.7657	194.6642	307.0233 (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	228.2820	201.9098	214.6916	189.3553	183.9291	166.1560	164.3470	170.6726	172.3124	191.6294	203.1157	225.8790 (64)	
Efficiency of water heater (217)m	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000	90.0000 (216)	
Fuel for water heating, kWh/month	197.0256	173.2027	181.9252	155.6002	147.7447	129.8233	125.9868	133.0152	136.6637	156.3005	170.8896	194.3556 (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	71.4830	64.5653	71.4830	69.1771	71.4830	69.1771	71.4830	71.4830	69.1771	71.4830	69.1771	71.4830 (231)	
Lighting	24.8502	19.9358	17.9499	13.1509	10.1581	8.2993	9.2666	12.0451	15.6453	20.5275	23.1858	25.5409 (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													1415.8509 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													90.0000
Water heating fuel used													1902.5332 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)													155.6544 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
maintaining electric keep-hot facility for gas combi boiler													600.0000 (230f)
Total electricity for the above, kWh/year													841.6544 (231)
Electricity for lighting (calculated in Appendix L)													200.5554 (232)

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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	4360.5939 (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	1415.8509	0.2100	297.3287 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1902.5332	0.2100	399.5320 (264)
Space and water heating			696.8607 (265)
Pumps, fans and electric keep-hot	841.6544	0.1387	116.7478 (267)
Energy for lighting	200.5554	0.1443	28.9463 (268)
Total CO2, kg/year			842.5548 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3300 (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	1415.8509	1.1300	1599.9115 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1902.5332	1.1300	2149.8625 (278)
Space and water heating			3749.7741 (279)
Pumps, fans and electric keep-hot	841.6544	1.5128	1273.2548 (281)
Energy for lighting	200.5554	1.5338	307.6185 (282)
Total Primary energy kWh/year			5330.6474 (286)
Dwelling Primary energy Rate (DPER)			71.6900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.9500 (1b)	x 2.5000 (2b)	= 102.3750 (1b) - (3b)
First floor	33.4100 (1c)	x 2.7000 (2c)	= 90.2070 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.3600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 192.5820 (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)

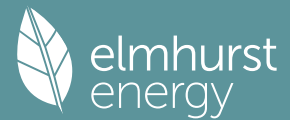
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1558 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4058	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3449 (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	0.4398	0.4311	0.4225	0.3794	0.3708	0.3277	0.3277	0.3190	0.3449	0.3708	0.3880	0.4053 (22b)
Effective ac	0.5967	0.5929	0.5893	0.5720	0.5687	0.5537	0.5537	0.5509	0.5595	0.5687	0.5753	0.5821 (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 Opening Type (Uw = 1.20)			14.0000	1.1450	16.0305		(27)

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External Walls	63.4000	14.0000	49.4000	0.1800	8.8920	(29a)
Dormer	13.2000		13.2000	0.1800	2.3760	(29a)
Mansard Walls	7.2000		7.2000	0.1800	1.2960	(29a)
Sloped C	35.0000		35.0000	0.1100	3.8500	(30)
Flat Roof	7.5400		7.5400	0.1100	0.8294	(30)
Total net area of external elements Aum(A, m2)			126.3400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	33.2739		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				76.1493 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200	
E3 Sill	8.4000	0.0500	0.4200	
E4 Jamb	10.0000	0.0500	0.5000	
E18 Party wall between dwellings	10.0000	0.0600	0.6000	
E7 Party floor between dwellings (in blocks of flats)	36.6000	0.0700	2.5620	
E16 Corner (normal)	10.0000	0.0900	0.9000	
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000	
E13 Gable (insulation at rafter level)	6.1300	0.0800	0.4904	
P4 Party wall - Roof (insulation at ceiling level)	6.1300	0.1200	0.7356	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.0280 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 40.3019 (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	37.9212	37.6826	37.4487	36.3501	36.1445	35.1877	35.1877	35.0105	35.5562	36.1445	36.5603	36.9951	(38)
Heat transfer coeff	78.2231	77.9845	77.7506	76.6520	76.4465	75.4896	75.4896	75.3124	75.8582	76.4465	76.8623	77.2970	(39)
Average = Sum(39)m / 12 =												76.6510	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0520	1.0487	1.0456	1.0308	1.0281	1.0152	1.0152	1.0128	1.0201	1.0281	1.0337	1.0395	(40)
HLP (average)												1.0308	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3472	(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	73.2964	72.2078	70.6749	67.8485	65.7321	63.3854	62.1178	63.6400	65.2974	67.8084	70.6931	73.0486	73.0486	(42b)
Hot water usage for other uses	38.6673	37.2612	35.8551	34.4490	33.0430	31.6369	31.6369	33.0430	34.4490	35.8551	37.2612	38.6673	38.6673	(42c)
Average daily hot water use (litres/day)													103.1094	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content (annual)	111.9637	109.4690	106.5300	102.2975	98.7751	95.0222	93.7547	96.6829	99.7464	103.6636	107.9543	111.7159	111.7159	(44)
Distribution loss (46)m = 0.15 x (45)m	177.3231	155.8824	163.7327	140.0402	132.9702	116.8409	113.3881	119.7137	122.9973	140.6705	153.8007	174.9201	174.9201	(45)
Total = Sum(45)m =	26.5985	23.3824	24.5599	21.0060	19.9455	17.5261	17.0082	17.9570	18.4496	21.1006	23.0701	26.2380	26.2380	(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	50.9589	46.0274	50.9589	49.3151	50.3347	46.8603	47.7763	49.2686	49.1900	50.9589	49.3151	50.9589	50.9589	(61)
Total heat required for water heating calculated for each month	228.2820	201.9098	214.6916	189.3553	183.3049	163.7012	161.1645	168.9822	172.1873	191.6294	203.1157	225.8790	225.8790	(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	228.2820	201.9098	214.6916	189.3553	183.3049	163.7012	161.1645	168.9822	172.1873	191.6294	203.1157	225.8790	225.8790	(64)
12Total per year (kWh/year)													2304.2029	(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 =													0.0000	(64a)
Heat gains from water heating, kWh/month	71.6997	63.3378	67.1808	58.8921	56.7963	50.5647	49.6456	52.1219	53.1941	59.5127	63.4675	70.9006	70.9006	(65)

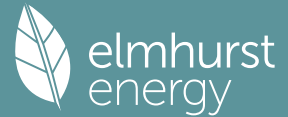
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	117.3581	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	106.0519	117.4146	106.0519	109.5870	106.0519	109.5870	106.0519	106.0519	109.5870	106.0519	109.5870	106.0519	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	207.2521	209.4027	203.9832	192.4457	177.8817	164.1935	155.0490	152.8984	158.3179	169.8554	184.4194	198.1076	(68)
Pumps, fans	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	34.7358	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	-93.8865	(71)
Total internal gains	96.3705	94.2526	90.2968	81.7946	76.3391	70.2287	66.7280	70.0564	73.8807	79.9901	88.1493	95.2966	(72)
	470.8820	482.2774	461.5394	445.0348	421.4801	402.2167	386.0364	387.2141	399.9931	417.1049	443.3632	460.6635	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North	8.4000		10.6334		0.6300		0.7000		0.7700		27.2975 (74)	
South	5.6000		46.7521		0.6300		0.7000		0.7700		80.0130 (78)	
Solar gains	107.3105	183.2076	255.5670	331.0444	388.4005	394.5295	376.5611	331.6141	280.9496	203.4376	128.5177	91.8952 (83)
Total gains	578.1925	665.4851	717.1064	776.0791	809.8807	796.7463	762.5975	718.8283	680.9427	620.5425	571.8809	552.5587 (84)
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	20.1079	20.1695	20.2301	20.5201	20.5753	20.8361	20.8361	20.8851	20.7348	20.5753	20.4639	20.3489
alpha	2.3405	2.3446	2.3487	2.3680	2.3717	2.3891	2.3891	2.3923	2.3823	2.3717	2.3643	2.3566
util living area	0.9115	0.8795	0.8388	0.7628	0.6564	0.5179	0.3997	0.4344	0.6074	0.7847	0.8792	0.9187 (86)
MIT	18.4017	18.7624	19.2421	19.8715	20.3960	20.7613	20.9073	20.8841	20.6290	19.9623	19.0997	18.3491 (87)
Th 2	20.0403	20.0429	20.0455	20.0577	20.0600	20.0707	20.0707	20.0727	20.0666	20.0600	20.0554	20.0505 (88)
util rest of house	0.9017	0.8667	0.8213	0.7364	0.6166	0.4601	0.3255	0.3597	0.5522	0.7551	0.8643	0.9097 (89)
MIT 2	17.0033	17.4548	18.0541	18.8330	19.4562	19.8691	20.0109	19.9943	19.7344	18.9598	17.8932	16.9432 (90)
Living area fraction	17.6145	18.0263	18.5733	19.2869	19.8669	20.2590	20.4027	20.3832	20.1254	19.3979	18.4205	17.5576 (92)
MIT	17.6145	18.0263	18.5733	19.2869	19.8669	20.2590	20.4027	20.3832	20.1254	19.3979	18.4205	17.5576 (93)
Temperature adjustment												0.0000
adjusted MIT	17.6145	18.0263	18.5733	19.2869	19.8669	20.2590	20.4027	20.3832	20.1254	19.3979	18.4205	17.5576 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8695	0.8329	0.7889	0.7120	0.6078	0.4724	0.3528	0.3856	0.5559	0.7312	0.8320	0.8786 (94)
Useful gains	502.7551	554.3127	565.7260	552.5853	492.2185	376.3513	269.0620	277.2029	378.5496	453.7241	475.8013	485.4691 (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	1041.5026	1023.6462	938.7103	796.1750	624.3317	427.1989	287.0618	299.9836	457.0766	672.5715	870.1199	1032.5054 (97)
Space heating kWh	400.8281	315.3921	277.5004	175.3845	98.2922	0.0000	0.0000	0.0000	0.0000	162.8225	283.9094	406.9950 (98a)
Space heating requirement - total per year (kWh/year)												2121.1242
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	400.8281	315.3921	277.5004	175.3845	98.2922	0.0000	0.0000	0.0000	0.0000	162.8225	283.9094	406.9950 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2121.1242
Space heating per m2										(98c) / (4) =		28.5251 (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	400.8281	315.3921	277.5004	175.3845	98.2922	0.0000	0.0000	0.0000	0.0000	162.8225	283.9094	406.9950 (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)	433.7967	341.3335	300.3251	189.8101	106.3769	0.0000	0.0000	0.0000	0.0000	176.2148	307.2612	440.4708 (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	228.2820	201.9098	214.6916	189.3553	183.3049	163.7012	161.1645	168.9822	172.1873	191.6294	203.1157	225.8790 (64)
Efficiency of water heater (217)m	85.5744	85.3329	84.9323	84.2175	83.1062	80.3000	80.3000	80.3000	80.3000	84.0343	85.0990	80.3000 (216)
Fuel for water heating, kWh/month	266.7644	236.6142	252.7796	224.8408	220.5670	203.8620	200.7030	210.4386	214.4300	228.0371	238.6817	263.7942 (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	22.0355	17.6777	15.9168	11.6613	9.0075	7.3592	8.2170	10.6808	13.8732	18.2024	20.5596	22.6479 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-25.2262	-36.6749	-54.3463	-63.0584	-69.6870	-65.6602	-64.8545	-60.3917	-52.8005	-42.8054	-28.1250	-21.6816 (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	-11.0664	-23.5826	-47.4374	-72.0793	-96.1195	-96.8742	-95.7355	-80.6886	-58.6548	-34.0005	-14.8639	-8.7287 (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												2295.5890 (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												2761.5128 (219)

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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)	177.8391 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1225.1431 (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	4095.7978 (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	2295.5890	0.2100	482.0737 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2761.5128	0.2100	579.9177 (264)
Space and water heating			1061.9914 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	177.8391	0.1443	25.6677 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-585.3117	0.1339	-78.3970
PV Unit electricity exported	-639.8314	0.1256	-80.3348
Total			-158.7318 (269)
Total CO2, kg/year			940.8565 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6500 (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	2295.5890	1.1300	2594.0155 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2761.5128	1.1300	3120.5095 (278)
Space and water heating			5714.5250 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	177.8391	1.5338	272.7755 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-585.3117	1.4950	-875.0324
PV Unit electricity exported	-639.8314	0.4609	-294.8737
Total			-1169.9061 (283)
Total Primary energy kWh/year			4947.4952 (286)
Target Primary Energy Rate (TPER)			66.5300 (287)