Full SAP Calculation Printout

Property Reference	Flat 1_Copy	**Issued on Date**	22/11/2023
Assessment Reference	001_Copy	**Prop Type Ref**	118 Malden Road
Property			

SAP Rating	83 B	**DER**	8.99	**TER**	11.27
Environmental	93 A	**% DER < TER**			20.23
CO_2 Emissions (t/year)	0.57	**DFEE**	20.79	**TFEE**	23.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.21
% DPER < TPER	-0.05	**DPER**	59.63	**TPER**	59.60

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	68.3500	(1a)	x 2.5000	(2a) =	170.8750	(1a) - (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8750	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)

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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	
Front (Uw = 1.20)			15.4400	1.1450	17.6794			(27)
Ground/basement			68.3500	0.1200	8.2020	110.0000	7518.4998	(28)
External Walls	23.0000	15.4400	7.5600	0.1800	1.3608	70.0000	529.2000	(29a)
Total net area of external elements Aum(A, m2)			91.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2422			(33)
Party Ceiling 1			68.3500			30.0000	2050.5000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10098.1998	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.7425	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.1000	0.0300	0.2130
E3 Sill	2.1000	0.0400	0.0840
E4 Jamb	13.4000	0.0500	0.6700
E5 Ground floor (normal)	9.2000	0.1600	1.4720

E18 Party wall between dwellings											10.0000	0.0600	0.6000	
E7 Party floor between dwellings (in blocks of flats)											9.2000	0.0700	0.6440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														3.6830 (36)
Point Thermal bridges													(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =		30.9252 (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	14.7774	14.5976	14.4179	13.5192	13.3395	12.4408	12.4408	12.2610	12.8002	13.3395	13.6989	14.0584	(38)
Heat transfer coeff	45.7026	45.5228	45.3431	44.4444	44.2647	43.3660	43.3660	43.1862	43.7254	44.2647	44.6241	44.9836	(39)
Average = Sum(39)m / 12 =												44.3995	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6687	0.6660	0.6634	0.6502	0.6476	0.6345	0.6345	0.6318	0.6397	0.6476	0.6529	0.6581	(40)
HLP (average)												0.6496	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2054	(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	70.5446	69.4969	68.0215	65.3012	63.2643	61.0057	59.7857	61.2507	62.8459	65.2627	68.0390	70.3061	(42b)
Hot water usage for other uses	37.2156	35.8623	34.5090	33.1557	31.8024	30.4491	30.4491	31.8024	33.1557	34.5090	35.8623	37.2156	(42c)
Average daily hot water use (litres/day)												99.2383	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.7602	105.3592	102.5305	98.4569	95.0667	91.4548	90.2348	93.0531	96.0016	99.7717	103.9013	107.5217	(44)
Energy conte	170.6658	150.0301	157.5856	134.7826	127.9781	112.4543	109.1312	115.2192	118.3796	135.3893	148.0265	168.3530	(45)
Energy content (annual)										Total = Sum(45)m =		1647.9952	
Distribution loss (46)m = 0.15 x (45)m	25.5999	22.5045	23.6378	20.2174	19.1967	16.8682	16.3697	17.2829	17.7569	20.3084	22.2040	25.2529	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	221.6247	196.0575	208.5445	184.0977	178.9370	161.7694	160.0901	166.1781	167.6946	186.3482	197.3415	219.3119	(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	221.6247	196.0575	208.5445	184.0977	178.9370	161.7694	160.0901	166.1781	167.6946	186.3482	197.3415	219.3119	(64)
										Total per year (kWh/year) = Sum(64)m =		2247.9952	(64)
12Total per year (kWh/year)												2248	(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	69.4861	61.3919	65.1369	57.1440	55.2924	49.7198	49.0258	51.0501	51.6900	57.7567	61.5476	68.7171	(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	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.5387	107.9893	97.5387	100.7900	97.5387	100.7900	97.5387	97.5387	100.7900	97.5387	100.7900	97.5387	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.4158	195.4229	190.3652	179.5979	166.0062	153.2319	144.6979	142.6908	147.7485	158.5158	172.1075	184.8818	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	(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)	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	(71)
Water heating gains (Table 5)	93.3953	91.3569	87.5497	79.3667	74.3178	69.0553	65.8949	68.6157	71.7916	77.6299	85.4827	92.3617	(72)
Total internal gains	443.4310	453.8502	434.5347	418.8357	396.9438	379.1584	364.2127	364.9264	376.4113	392.7655	417.4614	433.8633	(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	2.9400	10.6334	0.7200	0.7000	0.7700	10.9190	(74)
South	12.5000	46.7521	0.7200	0.7000	0.7700	204.1148	(78)

Solar gains	215.0338	355.1543	461.2807	538.2267	578.2382	564.7744	548.2516	518.7967	487.4541	385.3996	255.4157	185.4766	(83)
Total gains	658.4648	809.0045	895.8154	957.0624	975.1820	943.9327	912.4643	883.7231	863.8654	778.1652	672.8771	619.3400	(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	61.3763	61.6187	61.8629	63.1138	63.3701	64.6834	64.6834	64.9526	64.1516	63.3701	62.8596	62.3573
alpha	5.0918	5.1079	5.1242	5.2076	5.2247	5.3122	5.3122	5.3302	5.2768	5.2247	5.1906	5.1572

util living area													
	0.8909	0.7924	0.6868	0.5493	0.4194	0.2937	0.2091	0.2247	0.3484	0.5754	0.8025	0.9085	(86)
MIT	20.5864	20.7557	20.8551	20.9163	20.9354	20.9411	20.9416	20.9417	20.9397	20.9154	20.7792	20.5530	(87)
Th 2	20.3686	20.3709	20.3733	20.3850	20.3873	20.3991	20.3991	20.4014	20.3944	20.3873	20.3826	20.3780	(88)
util rest of house													
	0.8779	0.7734	0.6636	0.5237	0.3925	0.2662	0.1805	0.1955	0.3181	0.5449	0.7810	0.8970	(89)
MIT 2	19.8899	20.0915	20.2069	20.2849	20.3066	20.3238	20.3242	20.3267	20.3178	20.2874	20.1330	19.8582	(90)
Living area fraction										fLA = Living area / (4) =		0.4892	(91)
MIT	20.2307	20.4164	20.5241	20.5938	20.6142	20.6258	20.6262	20.6276	20.6221	20.5946	20.4491	20.1981	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2307	20.4164	20.5241	20.5938	20.6142	20.6258	20.6262	20.6276	20.6221	20.5946	20.4491	20.1981	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8748	0.7748	0.6693	0.5325	0.4025	0.2766	0.1913	0.2066	0.3295	0.5553	0.7834	0.8934	(94)
Useful gains	576.0308	626.8096	599.5727	509.6153	392.4972	261.1076	174.5794	182.5425	284.6296	432.1151	527.1469	553.3470	(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	728.0721	706.3518	635.8939	519.7239	394.5840	261.3134	174.6010	182.5749	285.1812	442.4082	595.6930	719.6536	(97)
Space heating kWh	113.1187	53.4524	27.0230	7.2782	1.5525	0.0000	0.0000	0.0000	0.0000	7.6581	49.3532	123.7321	(98a)
Space heating requirement - total per year (kWh/year)												383.1681	
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	113.1187	53.4524	27.0230	7.2782	1.5525	0.0000	0.0000	0.0000	0.0000	7.6581	49.3532	123.7321	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												383.1681	
Space heating per m2											(98c) / (4) =	5.6060	(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	113.1187	53.4524	27.0230	7.2782	1.5525	0.0000	0.0000	0.0000	0.0000	7.6581	49.3532	123.7321	(98)
Space heating efficiency (main heating system 1)	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)	125.6874	59.3915	30.0255	8.0869	1.7251	0.0000	0.0000	0.0000	0.0000	8.5090	54.8369	137.4801	(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	221.6247	196.0575	208.5445	184.0977	178.9370	161.7694	160.0901	166.1781	167.6946	186.3482	197.3415	219.3119	(64)
Efficiency of water heater												90.0000	(216)
(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	(217)
Fuel for water heating, kWh/month	189.6286	166.7001	175.0951	149.7585	142.1979	124.9493	121.2569	128.0214	131.5328	150.4325	164.4739	187.0589	(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	69.9929	63.2194	69.9929	67.7350	69.9929	67.7350	69.9929	69.9929	67.7350	69.9929	67.7350	69.9929	(231)
Lighting	22.5142	18.0617	16.2626	11.9147	9.2032	7.5191	8.3955	10.9128	14.1746	18.5979	21.0062	23.1399	(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	425.7424	(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	1831.1058	(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)	138.1097	(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	824.1097	(231)
Electricity for lighting (calculated in Appendix L)	181.7024	(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	3262.6602	(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	425.7424	0.2100	89.4059	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1831.1058	0.2100	384.5322	(264)
Space and water heating			473.9381	(265)
Pumps, fans and electric keep-hot	824.1097	0.1387	114.3142	(267)
Energy for lighting	181.7024	0.1443	26.2253	(268)
Total CO2, kg/year			614.4776	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.9900	(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	425.7424	1.1300	481.0889	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1831.1058	1.1300	2069.1495	(278)
Space and water heating			2550.2384	(279)
Pumps, fans and electric keep-hot	824.1097	1.5128	1246.7132	(281)
Energy for lighting	181.7024	1.5338	278.7012	(282)
Total Primary energy kWh/year			4075.6527	(286)
Dwelling Primary energy Rate (DPER)			59.6300	(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)	
Basement floor		68.3500 (1a)	x	2.5000 (2a)	=	170.8750	(1a) - (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.8750	(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)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1170 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3670 (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) =	0.3120 (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	0.3978	0.3900	0.3822	0.3432	0.3354	0.2964	0.2964	0.2886	0.3120	0.3354	0.3510	0.3666	(22b)
Effective ac	0.5791	0.5760	0.5730	0.5589	0.5562	0.5439	0.5439	0.5416	0.5487	0.5562	0.5616	0.5672	(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)			15.4400	1.1450	17.6794			(27)
Ground/basement			68.3500	0.1300	8.8855			(28)
External Walls	23.0000	15.4400	7.5600	0.1800	1.3608			(29a)
Total net area of external elements Aum(A, m2)			91.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9257			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							157.7425	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	7.1000	0.0500	0.3550		
E3 Sill	2.1000	0.0500	0.1050		
E4 Jamb	13.4000	0.0500	0.6700		
E5 Ground floor (normal)	9.2000	0.1600	1.4720		
E18 Party wall between dwellings	10.0000	0.0600	0.6000		
E7 Party floor between dwellings (in blocks of flats)	9.2000	0.0700	0.6440		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				3.8460	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	31.7717	(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	32.6556	32.4824	32.3126	31.5150	31.3658	30.6711	30.6711	30.5425	30.9387	31.3658	31.6677	31.9833	(38)
Heat transfer coeff	64.4273	64.2541	64.0843	63.2867	63.1375	62.4428	62.4428	62.3142	62.7104	63.1375	63.4394	63.7550	(39)
Average = Sum(39)m / 12 =												63.2860	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9426	0.9401	0.9376	0.9259	0.9237	0.9136	0.9136	0.9117	0.9175	0.9237	0.9282	0.9328	(40)
HLP (average)												0.9259	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2054	(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	70.5446	69.4969	68.0215	65.3012	63.2643	61.0057	59.7857	61.2507	62.8459	65.2627	68.0390	70.3061	(42b)
Hot water usage for other uses	37.2156	35.8623	34.5090	33.1557	31.8024	30.4491	30.4491	31.8024	33.1557	34.5090	35.8623	37.2156	(42c)
Average daily hot water use (litres/day)												99.2383	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.7602	105.3592	102.5305	98.4569	95.0667	91.4548	90.2348	93.0531	96.0016	99.7717	103.9013	107.5217	(44)
Energy conte	170.6658	150.0301	157.5856	134.7826	127.9781	112.4543	109.1312	115.2192	118.3796	135.3893	148.0265	168.3530	(45)
Energy content (annual)										Total = Sum(45)m =		1647.9952	
Distribution loss (46)m = 0.15 x (45)m	25.5999	22.5045	23.6378	20.2174	19.1967	16.8682	16.3697	17.2829	17.7569	20.3084	22.2040	25.2529	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.5541	48.4450	45.1010	45.9827	47.4189	47.3432	50.8426	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	221.6247	196.0575	208.5445	183.3368	176.4230	157.5553	155.1138	162.6381	165.7228	186.2318	197.3415	219.3119	(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	221.6247	196.0575	208.5445	183.3368	176.4230	157.5553	155.1138	162.6381	165.7228	186.2318	197.3415	219.3119	(64)
										Total per year (kWh/year) = Sum(64)m =		2229.9018	(64)
12Total per year (kWh/year)												2230	(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	69.4861	61.3919	65.1369	56.9538	54.6640	48.6663	47.7818	50.1651	51.1970	57.7276	61.5476	68.7171	(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	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	110.2704	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.5387	107.9893	97.5387	100.7900	97.5387	100.7900	97.5387	97.5387	100.7900	97.5387	100.7900	97.5387	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.4158	195.4229	190.3652	179.5979	166.0062	153.2319	144.6979	142.6908	147.7485	158.5158	172.1075	184.8818	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	34.0270	(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)	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	-88.2164	(71)
Water heating gains (Table 5)	93.3953	91.3569	87.5497	79.1024	73.4731	67.5921	64.2228	67.4262	71.1070	77.5908	85.4827	92.3617	(72)
Total internal gains	443.4310	453.8502	434.5347	418.5715	396.0991	377.6951	362.5405	363.7369	375.7266	392.7264	417.4614	433.8633	(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	2.9400	10.6334	0.6300	0.7000	0.7700	9.5541	(74)
South	12.5000	46.7521	0.6300	0.7000	0.7700	178.6005	(78)

Solar gains	188.1546	310.7600	403.6206	470.9483	505.9584	494.1775	479.7201	453.9471	426.5223	337.2247	223.4887	162.2920	(83)
Total gains	631.5856	764.6102	838.1553	889.5198	902.0575	871.8727	842.2607	817.6840	802.2490	729.9511	640.9501	596.1554	(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	46.4852	46.6105	46.7340	47.3230	47.4348	47.9625	47.9625	48.0616	47.7579	47.4348	47.2091	46.9754	
alpha	4.0990	4.1074	4.1156	4.1549	4.1623	4.1975	4.1975	4.2041	4.1839	4.1623	4.1473	4.1317	
util living area	0.9502	0.9042	0.8437	0.7414	0.6082	0.4488	0.3242	0.3478	0.5198	0.7614	0.9098	0.9586	(86)
MIT	19.8870	20.1968	20.4798	20.7503	20.9094	20.9803	20.9960	20.9946	20.9630	20.7629	20.2986	19.8282	(87)
Th 2	20.1314	20.1336	20.1357	20.1455	20.1474	20.1560	20.1560	20.1576	20.1527	20.1474	20.1436	20.1397	(88)
util rest of house	0.9415	0.8893	0.8209	0.7074	0.5622	0.3929	0.2629	0.2853	0.4620	0.7225	0.8932	0.9512	(89)
MIT 2	18.8548	19.2359	19.5773	19.8970	20.0683	20.1427	20.1541	20.1549	20.1257	19.9198	19.3752	18.7879	(90)
Living area fraction										fLA = Living area / (4) =		0.4892	(91)
MIT	19.3598	19.7060	20.0188	20.3145	20.4798	20.5525	20.5660	20.5657	20.5354	20.3323	19.8270	19.2969	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3598	19.7060	20.0188	20.3145	20.4798	20.5525	20.5660	20.5657	20.5354	20.3323	19.8270	19.2969	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9324	0.8810	0.8176	0.7144	0.5806	0.4194	0.2928	0.3157	0.4885	0.7314	0.8862	0.9425	(94)
Useful gains	588.8660	673.6386	685.2693	635.5023	523.6974	365.6673	246.6222	258.1577	391.9153	533.8738	567.9959	561.8674	(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	970.2651	951.3467	866.3438	722.3840	554.3366	371.6907	247.6501	259.5852	403.5644	614.4738	807.3919	962.5001	(97)
Space heating kWh	283.7610	186.6198	134.7194	62.5548	22.7956	0.0000	0.0000	0.0000	0.0000	59.9664	172.3651	298.0707	(98a)
Space heating requirement - total per year (kWh/year)												1220.8528	
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	283.7610	186.6198	134.7194	62.5548	22.7956	0.0000	0.0000	0.0000	0.0000	59.9664	172.3651	298.0707	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1220.8528	
Space heating per m2											(98c) / (4) =	17.8618	(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	283.7610	186.6198	134.7194	62.5548	22.7956	0.0000	0.0000	0.0000	0.0000	59.9664	172.3651	298.0707	(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)	307.1006	201.9695	145.8002	67.7000	24.6705	0.0000	0.0000	0.0000	0.0000	64.8987	186.5423	322.5873	(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	221.6247	196.0575	208.5445	183.3368	176.4230	157.5553	155.1138	162.6381	165.7228	186.2318	197.3415	219.3119	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.9121	84.2758	83.4690	82.3261	81.1988	80.3000	80.3000	80.3000	80.3000	82.2377	84.0927	85.0394	(217)
Fuel for water heating, kWh/month	261.0049	232.6379	249.8466	222.6959	217.2729	196.2084	193.1679	202.5381	206.3796	226.4555	234.6715	257.8944	(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	20.2666	16.2586	14.6391	10.7252	8.2845	6.7685	7.5574	9.8234	12.7596	16.7413	18.9092	20.8299	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3329	-27.1724	-41.0416	-48.5706	-54.5117	-51.6696	-51.0426	-47.1245	-40.5888	-32.1297	-20.6216	-15.6991	(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	-6.6866	-14.3680	-29.1264	-44.5909	-59.7925	-60.3789	-59.6654	-50.1338	-36.2466	-20.8190	-9.0142	-5.2652	(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	1321.2692	(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	2700.7737	(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)	163.5632	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-844.5925	(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	3427.0137	(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	1321.2692	0.2100	277.4665	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.7737	0.2100	567.1625	(264)
Space and water heating			844.6290	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.5632	0.1443	23.6072	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-448.5051	0.1335	-59.8947	
PV Unit electricity exported	-396.0874	0.1253	-49.6459	
Total			-109.5405	(269)
Total CO2, kg/year			770.6250	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2700	(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	1321.2692	1.1300	1493.0342	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.7737	1.1300	3051.8742	(278)
Space and water heating			4544.9085	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.5632	1.5338	250.8787	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-448.5051	1.4935	-669.8389	
PV Unit electricity exported	-396.0874	0.4601	-182.2240	
Total			-852.0629	(283)
Total Primary energy kWh/year			4073.8251	(286)
Target Primary Energy Rate (TPER)			59.6000	(287)