Full SAP Calculation Printout

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

SAP Rating	89 B	**DER**	2.99	**TER**	10.95
Environmental	98 A	**% DER < TER**			72.69
CO_2 Emissions (t/year)	0.17	**DFEE**	20.79	**TFEE**	23.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.21
% DPER < TPER	45.54	**DPER**	31.51	**TPER**	57.86

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)

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:													
Store volume												173.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0368	(55)
Total storage loss	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)
If cylinder contains dedicated solar storage	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.8066	179.0605	189.7264	165.8866	160.1189	143.5583	141.2720	147.3600	149.4836	167.5301	179.1305	200.4938	(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	202.8066	179.0605	189.7264	165.8866	160.1189	143.5583	141.2720	147.3600	149.4836	167.5301	179.1305	200.4938	(64)
										Total per year (kWh/year) = Sum(64)m =		2026.4272	(64)
12Total per year (kWh/year)												2026	(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	56.7464	49.8850	52.3972	44.8152	42.5527	37.3911	36.2861	38.3104	39.3612	45.0169	49.2188	55.9774	(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													
(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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)	76.2720	74.2336	70.4264	62.2434	57.1945	51.9320	48.7717	51.4925	54.6683	60.5066	68.3594	75.2384	(72)
Total internal gains	423.3077	433.7269	414.4114	398.7124	376.8205	362.0351	347.0894	347.8031	359.2880	372.6422	397.3381	413.7400	(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	638.3415	788.8812	875.6921	936.9391	955.0588	926.8094	895.3410	866.5998	846.7421	758.0419	652.7538	599.2167	(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	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	0.9007	0.8040	0.6987	0.5600	0.4280	0.2991	0.2131	0.2292	0.3553	0.5889	0.8163	0.9177	(86)
MIT	20.4986	20.7372	20.8784	20.9648	20.9922	20.9991	20.9999	20.9998	20.9977	20.9625	20.7661	20.4501	(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	0.8884	0.7855	0.6756	0.5341	0.4006	0.2711	0.1840	0.1994	0.3245	0.5579	0.7955	0.9071	(89)
MIT 2	19.7971	20.0815	20.2450	20.3504	20.3805	20.3985	20.3990	20.4013	20.3927	20.3519	20.1304	19.7465	(90)
Living area fraction										fLA = Living area / (4) =		0.4892	(91)
MIT	20.1403	20.4023	20.5549	20.6510	20.6798	20.6923	20.6930	20.6942	20.6887	20.6507	20.4414	20.0907	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1403	20.4023	20.5549	20.6510	20.6798	20.6923	20.6930	20.6942	20.6887	20.6507	20.4414	20.0907	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8836	0.7864	0.6824	0.5453	0.4137	0.2848	0.1982	0.2139	0.3395	0.5714	0.7976	0.9017	(94)
Useful gains	564.0602	620.3911	597.5716	510.9476	395.0971	263.9596	177.4703	185.4090	287.4500	433.1090	520.6050	540.3233	(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	723.9429	705.7068	637.2921	522.2663	397.4870	264.2000	177.4966	185.4483	288.0938	444.8890	595.3481	714.8232	(97)
Space heating kWh	118.9527	57.3322	29.5521	8.1494	1.7781	0.0000	0.0000	0.0000	0.0000	8.7643	53.8150	129.8279	(98a)
Space heating requirement - total per year (kWh/year)												408.1718	
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	118.9527	57.3322	29.5521	8.1494	1.7781	0.0000	0.0000	0.0000	0.0000	8.7643	53.8150	129.8279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												408.1718	
Space heating per m2										(98c) / (4) =		5.9718	(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)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(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	118.9527	57.3322	29.5521	8.1494	1.7781	0.0000	0.0000	0.0000	0.0000	8.7643	53.8150	129.8279	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	118.9527	57.3322	29.5521	8.1494	1.7781	0.0000	0.0000	0.0000	0.0000	8.7643	53.8150	129.8279	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.8066	179.0605	189.7264	165.8866	160.1189	143.5583	141.2720	147.3600	149.4836	167.5301	179.1305	200.4938	(64)
Efficiency of water heater												302.9550	(216)
(217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(217)
Fuel for water heating, kWh/month	66.9428	59.1047	62.6253	54.7562	52.8524	47.3860	46.6313	48.6409	49.3418	55.2987	59.1277	66.1794	(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	11.7299	10.5947	11.7299	11.3515	11.7299	11.3515	11.7299	11.7299	11.3515	11.7299	11.3515	11.7299	(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												408.1718	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												302.9550	
Water heating fuel used												668.8872	(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)
Total electricity for the above, kWh/year												138.1097	(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	1396.8711	(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	408.1718	0.1592	64.9640	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	668.8872	0.1410	94.3228	(264)
Space and water heating			159.2867	(265)
Pumps, fans and electric keep-hot	138.1097	0.1387	19.1575	(267)
Energy for lighting	181.7024	0.1443	26.2253	(268)
Total CO2, kg/year			204.6695	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9900	(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	408.1718	1.5891	648.6122	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	668.8872	1.5214	1017.6623	(278)
Space and water heating			1666.2745	(279)
Pumps, fans and electric keep-hot	138.1097	1.5128	208.9324	(281)
Energy for lighting	181.7024	1.5338	278.7012	(282)
Total Primary energy kWh/year			2153.9080	(286)
Dwelling Primary energy Rate (DPER)			31.5100	(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

	Length	Psi-value	Total
K1 Element			
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:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi 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	(61)
Total heat required for water heating calculated for each month	217.2607	192.1158	204.1805	179.8745	174.5730	157.5462	155.7261	161.8141	163.4714	181.9842	193.1183	214.9479	(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	217.2607	192.1158	204.1805	179.8745	174.5730	157.5462	155.7261	161.8141	163.4714	181.9842	193.1183	214.9479	(64)
									Total per year (kWh/year) = Sum(64)m =			2196.6126	(64)
12Total per year (kWh/year)												2197	(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	94.0223	83.5536	89.6731	80.8887	79.8286	73.4645	73.5620	75.5863	75.4347	82.2928	85.2923	93.2533	(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)	126.3741	124.3357	120.5284	112.3454	107.2966	102.0341	98.8737	101.5945	104.7704	110.6087	118.4615	125.3404	(72)
Total internal gains	476.4097	486.8290	467.5134	451.8145	429.9226	412.1371	397.1914	397.9052	409.3901	425.7443	450.4401	466.8421	(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	664.5643	797.5890	871.1341	922.7628	935.8810	906.3147	876.9116	851.8523	835.9124	762.9690	673.9289	629.1341	(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	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	0.9420	0.8929	0.8296	0.7245	0.5905	0.4329	0.3117	0.3342	0.5012	0.7415	0.8968	0.9510	(86)
MIT	19.9476	20.2456	20.5162	20.7716	20.9188	20.9828	20.9966	20.9954	20.9677	20.7864	20.3486	19.8912	(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	0.9322	0.8769	0.8058	0.6900	0.5449	0.3786	0.2526	0.2740	0.4448	0.7017	0.8786	0.9426	(89)
MIT 2	18.9294	19.2943	19.6190	19.9194	20.0769	20.1444	20.1544	20.1553	20.1292	19.9439	19.4343	18.8660	(90)
Living area fraction										fLA = Living area / (4) =		0.4892	(91)
MIT	19.4275	19.7597	20.0579	20.3363	20.4888	20.5546	20.5664	20.5663	20.5394	20.3561	19.8816	19.3676	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4275	19.7597	20.0579	20.3363	20.4888	20.5546	20.5664	20.5663	20.5394	20.3561	19.8816	19.3676	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9228	0.8692	0.8035	0.6980	0.5635	0.4045	0.2814	0.3033	0.4709	0.7119	0.8723	0.9335	(94)
Useful gains	613.2844	693.2283	699.9238	644.0994	527.4035	366.5606	246.7933	258.3960	393.6403	543.1548	587.8696	587.3108	(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	974.6255	954.7979	868.8515	723.7689	554.9011	371.8213	247.6756	259.6205	403.8198	615.9741	810.8584	967.0072	(97)
Space heating kWh	268.8378	175.7748	125.6822	57.3621	20.4582	0.0000	0.0000	0.0000	0.0000	54.1776	160.5519	282.4941	(98a)
Space heating requirement - total per year (kWh/year)												1145.3388	
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	268.8378	175.7748	125.6822	57.3621	20.4582	0.0000	0.0000	0.0000	0.0000	54.1776	160.5519	282.4941	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1145.3388	
Space heating per m2											(98c) / (4) =	16.7570	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	268.8378	175.7748	125.6822	57.3621	20.4582	0.0000	0.0000	0.0000	0.0000	54.1776	160.5519	282.4941	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	291.2652	190.4385	136.1671	62.1474	22.1649	0.0000	0.0000	0.0000	0.0000	58.6973	173.9457	306.0608	(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	217.2607	192.1158	204.1805	179.8745	174.5730	157.5462	155.7261	161.8141	163.4714	181.9842	193.1183	214.9479	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5386	83.8609	83.0054	81.8047	80.6575	79.8000	79.8000	79.8000	79.8000	81.6996	83.6486	84.6735	(217)
Fuel for water heating, kWh/month	256.9958	229.0885	245.9848	219.8828	216.4374	197.4263	195.1454	202.7746	204.8514	222.7479	230.8685	253.8549	(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	1240.8871	(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	2676.0583	(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	3321.9161	(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	1240.8871	0.2100	260.5863	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2676.0583	0.2100	561.9722	(264)
Space and water heating			822.5585	(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			748.5545	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9500	(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	1240.8871	1.1300	1402.2024	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2676.0583	1.1300	3023.9458	(278)
Space and water heating			4426.1482	(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			3955.0648	(286)
Target Primary Energy Rate (TPER)			57.8600	(287)