Full SAP Calculation Printout

Property Reference	Flat 3	**Issued on Date**	22/11/2023
Assessment Reference	001	**Prop Type Ref**	118 Malden Road
Property			

SAP Rating	88 B	**DER**	3.50	**TER**	11.89
Environmental	97 A	**% DER < TER**			70.56
CO_2 Emissions (t/year)	0.18	**DFEE**	25.06	**TFEE**	25.69
Compliance Check	See BREL	**% DFEE < TFEE**			2.45
% DPER < TPER	41.76	**DPER**	36.67	**TPER**	62.97

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)	
Ground floor	61.8300	(1b)	x 2.5000	(2b) =	154.5750	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.8300					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.5750	(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)			18.8000	1.1450	21.5267			(27)
External Walls	55.7500	18.8000	36.9500	0.1800	6.6510	70.0000	2586.5000	(29a)
Total net area of external elements Aum(A, m2)			55.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.1777			(33)
Party Floor 1			61.8300			40.0000	2473.2000	(32d)
Party Ceiling 1			61.8300			30.0000	1854.9000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6914.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		111.8324 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.9500	0.0300	0.2685
E3 Sill	3.9500	0.0400	0.1580
E4 Jamb	15.6000	0.0500	0.7800
E18 Party wall between dwellings	5.0000	0.0600	0.3000

E7 Party floor between dwellings (in blocks of flats)									41.0000	0.0700	2.8700		
E16 Corner (normal)									5.0000	0.0900	0.4500		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												4.8265	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.0042	(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	13.3677	13.2051	13.0426	12.2296	12.0670	11.2540	11.2540	11.0914	11.5792	12.0670	12.3922	12.7174	(38)
Heat transfer coeff	46.3720	46.2094	46.0468	45.2338	45.0712	44.2582	44.2582	44.0957	44.5834	45.0712	45.3964	45.7216	(39)
Average = Sum(39)m / 12 =												45.1932	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7500	0.7474	0.7447	0.7316	0.7290	0.7158	0.7158	0.7132	0.7211	0.7290	0.7342	0.7395	(40)
HLP (average)												0.7309	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0329	(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	67.1953	66.1973	64.7920	62.2009	60.2606	58.1092	56.9472	58.3427	59.8621	62.1641	64.8087	66.9681	(42b)
Hot water usage for other uses	35.4487	34.1596	32.8706	31.5815	30.2925	29.0035	29.0035	30.2925	31.5815	32.8706	34.1596	35.4487	(42c)
Average daily hot water use (litres/day)												94.5267	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.6439	100.3569	97.6626	93.7824	90.5531	87.1127	85.9506	88.6352	91.4436	95.0347	98.9683	102.4168	(44)
Energy conte	162.5629	142.9070	150.1038	128.3834	121.9019	107.1152	103.9498	109.7488	112.7591	128.9612	140.9985	160.3599	(45)
Energy content (annual)										Total = Sum(45)m =		1569.7516	
Distribution loss (46)m = 0.15 x (45)m	24.3844	21.4360	22.5156	19.2575	18.2853	16.0673	15.5925	16.4623	16.9139	19.3442	21.1498	24.0540	(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	194.7037	171.9374	182.2446	159.4874	154.0427	138.2192	136.0906	141.8896	143.8631	161.1020	172.1025	192.5007	(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	194.7037	171.9374	182.2446	159.4874	154.0427	138.2192	136.0906	141.8896	143.8631	161.1020	172.1025	192.5007	(64)
										Total per year (kWh/year) = Sum(64)m =		1948.1836	(64)
12Total per year (kWh/year)												1948	(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	54.0522	47.5166	49.9095	42.6875	40.5324	35.6158	34.5633	36.4915	37.4924	42.8796	46.8820	53.3197	(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	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.5473	99.1416	89.5473	92.5322	89.5473	92.5322	89.5473	89.5473	92.5322	89.5473	92.5322	89.5473	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.5375	179.3798	174.7373	164.8540	152.3781	140.6524	132.8190	130.9767	135.6192	145.5026	157.9785	169.7041	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	(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)	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	(71)
Water heating gains (Table 5)	72.6508	70.7092	67.0827	59.2882	54.4790	49.4664	46.4561	49.0477	52.0728	57.6339	65.1139	71.6662	(72)
Total internal gains	393.2287	402.7237	384.8604	370.1675	349.8975	336.1442	322.3155	323.0648	333.7173	346.1769	369.1177	384.4107	(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	2.3000	10.6334	0.7200	0.7000	0.7700	8.5421	(74)
East	5.0000	19.6403	0.7200	0.7000	0.7700	34.2990	(76)
South	11.5000	46.7521	0.7200	0.7000	0.7700	187.7857	(78)

Solar gains	230.6267	390.9649	529.9939	648.4809	718.9160	710.4606	686.3140	634.2545	571.1013	430.7628	275.8946	197.5910	(83)
Total gains	623.8554	793.6887	914.8543	1018.6484	1068.8135	1046.6048	1008.6295	957.3194	904.8186	776.9396	645.0123	582.0017	(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	41.4199	41.5656	41.7124	42.4621	42.6153	43.3981	43.3981	43.5581	43.0815	42.6153	42.3100	42.0091	
alpha	3.7613	3.7710	3.7808	3.8308	3.8410	3.8932	3.8932	3.9039	3.8721	3.8410	3.8207	3.8006	
util living area													
	0.8659	0.7641	0.6528	0.5131	0.3856	0.2694	0.1928	0.2115	0.3365	0.5657	0.7838	0.8853	(86)
MIT	20.1716	20.5132	20.7503	20.9121	20.9748	20.9954	20.9991	20.9987	20.9888	20.8958	20.5537	20.1022	(87)
Th 2	20.2969	20.2992	20.3015	20.3130	20.3153	20.3269	20.3269	20.3292	20.3223	20.3153	20.3107	20.3061	(88)
util rest of house													
	0.8524	0.7452	0.6298	0.4876	0.3585	0.2414	0.1634	0.1808	0.3044	0.5346	0.7628	0.8733	(89)
MIT 2	19.3437	19.7537	20.0317	20.2236	20.2920	20.3234	20.3263	20.3284	20.3132	20.2123	19.8190	19.2668	(90)
Living area fraction										fLA = Living area / (4) =		0.5256	(91)
MIT	19.7789	20.1529	20.4094	20.5855	20.6509	20.6766	20.6800	20.6807	20.6683	20.5716	20.2052	19.7060	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7789	20.1529	20.4094	20.5855	20.6509	20.6766	20.6800	20.6807	20.6683	20.5716	20.2052	19.7060	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8415	0.7411	0.6334	0.4978	0.3718	0.2560	0.1788	0.1969	0.3209	0.5464	0.7594	0.8618	(94)
Useful gains	524.9730	588.2268	579.4984	507.0743	397.4226	267.9319	180.3884	188.4925	290.3170	424.5301	489.8107	501.5811	(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	717.7858	704.8277	640.4835	528.5796	403.4284	268.9405	180.5714	188.7604	292.8377	449.4315	594.9269	708.9568	(97)
Space heating kWh	143.4527	78.3558	45.3729	15.4838	4.4683	0.0000	0.0000	0.0000	0.0000	18.5266	75.6837	154.2875	(98a)
Space heating requirement - total per year (kWh/year)												535.6313	
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	143.4527	78.3558	45.3729	15.4838	4.4683	0.0000	0.0000	0.0000	0.0000	18.5266	75.6837	154.2875	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												535.6313	
Space heating per m2											(98c) / (4) =	8.6630	(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	143.4527	78.3558	45.3729	15.4838	4.4683	0.0000	0.0000	0.0000	0.0000	18.5266	75.6837	154.2875	(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)	143.4527	78.3558	45.3729	15.4838	4.4683	0.0000	0.0000	0.0000	0.0000	18.5266	75.6837	154.2875	(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	194.7037	171.9374	182.2446	159.4874	154.0427	138.2192	136.0906	141.8896	143.8631	161.1020	172.1025	192.5007	(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	64.2682	56.7534	60.1557	52.6439	50.8467	45.6237	44.9211	46.8352	47.4866	53.1769	56.8079	63.5410	(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	10.6109	9.5841	10.6109	10.2687	10.6109	10.2687	10.6109	10.6109	10.2687	10.6109	10.2687	10.6109	(231)
Lighting	20.2609	16.2540	14.6350	10.7222	8.2821	6.7666	7.5552	9.8206	12.7560	16.7365	18.9039	20.8240	(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												535.6313	(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												643.0604	(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)												124.9352	(230a)
Total electricity for the above, kWh/year												124.9352	(231)
Electricity for lighting (calculated in Appendix L)												163.5170	(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	1467.1439	(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	535.6313	0.1582	84.7625	(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)	643.0604	0.1410	90.6672	(264)
Space and water heating			175.4296	(265)
Pumps, fans and electric keep-hot	124.9352	0.1387	17.3301	(267)
Energy for lighting	163.5170	0.1443	23.6006	(268)
Total CO2, kg/year			216.3603	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	535.6313	1.5857	849.3676	(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)	643.0604	1.5213	978.3176	(278)
Space and water heating			1827.6852	(279)
Pumps, fans and electric keep-hot	124.9352	1.5128	189.0020	(281)
Energy for lighting	163.5170	1.5338	250.8079	(282)
Total Primary energy kWh/year			2267.4951	(286)
Dwelling Primary energy Rate (DPER)			36.6700	(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	61.8300	(1b)	x 2.5000	(2b) =	154.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.8300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.5750	(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) =	0.1294 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3794 (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) =	0.3225 (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	0.4112	0.4031	0.3950	0.3547	0.3467	0.3064	0.3064	0.2983	0.3225	0.3467	0.3628	0.3789	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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)			15.4600	1.1450	17.7023			(27)

External Walls	55.7500	15.4600	40.2900	0.1800	7.2522	(29a)
Total net area of external elements Aum(A, m2)			55.7500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.9545	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 121.8324 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.9500	0.0500	0.4475
E3 Sill	3.9500	0.0500	0.1975
E4 Jamb	15.6000	0.0500	0.7800
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E7 Party floor between dwellings (in blocks of flats)	41.0000	0.0700	2.8700
E16 Corner (normal)	5.0000	0.0900	0.4500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0450 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.9995 (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	29.8166	29.6491	29.4850	28.7142	28.5700	27.8986	27.8986	27.7743	28.1572	28.5700	28.8617	29.1667	(38)
Heat transfer coeff	59.8160	59.6486	59.4845	58.7137	58.5695	57.8981	57.8981	57.7738	58.1567	58.5695	58.8612	59.1662	(39)

Average = Sum(39)m / 12 = 58.7130

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9674	0.9647	0.9621	0.9496	0.9473	0.9364	0.9364	0.9344	0.9406	0.9473	0.9520	0.9569	(40)
HLP (average)												0.9496	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0329 (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

67.1953	66.1973	64.7920	62.2009	60.2606	58.1092	56.9472	58.3427	59.8621	62.1641	64.8087	66.9681	(42b)

Hot water usage for other uses

35.4487	34.1596	32.8706	31.5815	30.2925	29.0035	29.0035	30.2925	31.5815	32.8706	34.1596	35.4487	(42c)

Average daily hot water use (litres/day) 94.5267 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.6439	100.3569	97.6626	93.7824	90.5531	87.1127	85.9506	88.6352	91.4436	95.0347	98.9683	102.4168	(44)
Energy conte	162.5629	142.9070	150.1038	128.3834	121.9019	107.1152	103.9498	109.7488	112.7591	128.9612	140.9985	160.3599	(45)
Energy content (annual)										Total = Sum(45)m =		1569.7516	
Distribution loss (46)m = 0.15 x (45)m	24.3844	21.4360	22.5156	19.2575	18.2853	16.0673	15.5925	16.4623	16.9139	19.3442	21.1498	24.0540	(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

209.1578	184.9927	196.6987	173.4753	168.4968	152.2071	150.5447	156.3437	157.8510	175.5561	186.0903	206.9548	(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

209.1578	184.9927	196.6987	173.4753	168.4968	152.2071	150.5447	156.3437	157.8510	175.5561	186.0903	206.9548	(64)
									Total per year (kWh/year) = Sum(64)m =		2118.3690	(64)

12Total per year (kWh/year) 2118 (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

91.3281	81.1851	87.1854	78.7610	77.8083	71.6893	71.8392	73.7674	73.5659	80.1555	82.9555	90.5956	(65)

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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	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	101.6437	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.5473	99.1416	89.5473	92.5322	89.5473	92.5322	89.5473	89.5473	92.5322	89.5473	92.5322	89.5473	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.5375	179.3798	174.7373	164.8540	152.3781	140.6524	132.8190	130.9767	135.6192	145.5026	157.9785	169.7041	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	33.1644	(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)	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	-81.3150	(71)
Water heating gains (Table 5)	122.7528	120.8112	117.1847	109.3902	104.5811	99.5685	96.5581	99.1497	102.1748	107.7359	115.2159	121.7683	(72)
Total internal gains	446.3307	455.8258	437.9624	423.2695	402.9995	386.2462	372.4176	373.1669	383.8194	399.2789	422.2197	437.5128	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.8900	10.6334	0.6300	0.7000	0.7700	6.1419	(74)
East	4.1100	19.6403	0.6300	0.7000	0.7700	24.6695	(76)

South			9.4600	46.7521	0.6300	0.7000	0.7700					135.1648	(78)
Solar gains	165.9763	281.3616	381.4004	466.6455	517.3124	511.2206	493.8487	456.4011	410.9749	309.9983	198.5533	142.2021	(83)
Total gains	612.3070	737.1874	819.3628	889.9151	920.3119	897.4668	866.2663	829.5680	794.7943	709.2772	620.7730	579.7149	(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	34.9818	35.0800	35.1768	35.6386	35.7263	36.1406	36.1406	36.2184	35.9799	35.7263	35.5493	35.3660	
alpha	3.3321	3.3387	3.3451	3.3759	3.3818	3.4094	3.4094	3.4146	3.3987	3.3818	3.3700	3.3577	
util living area	0.9139	0.8592	0.7892	0.6782	0.5463	0.4008	0.2909	0.3159	0.4791	0.7099	0.8642	0.9246	(86)
MIT	19.6434	19.9895	20.3322	20.6681	20.8696	20.9661	20.9913	20.9884	20.9362	20.6718	20.1258	19.5810	(87)
Th 2	20.1106	20.1128	20.1151	20.1255	20.1275	20.1367	20.1367	20.1384	20.1331	20.1275	20.1235	20.1194	(88)
util rest of house	0.9023	0.8422	0.7654	0.6453	0.5040	0.3502	0.2351	0.2584	0.4257	0.6721	0.8449	0.9143	(89)
MIT 2	18.5525	18.9763	19.3896	19.7874	20.0087	20.1117	20.1321	20.1319	20.0831	19.8032	19.1594	18.4819	(90)
Living area fraction									fLA = Living area / (4) =			0.5256	(91)
MIT	19.1259	19.5089	19.8851	20.2503	20.4613	20.5608	20.5837	20.5821	20.5315	20.2598	19.6674	19.0596	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1259	19.5089	19.8851	20.2503	20.4613	20.5608	20.5837	20.5821	20.5315	20.2598	19.6674	19.0596	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8872	0.8292	0.7587	0.6502	0.5205	0.3753	0.2641	0.2882	0.4507	0.6781	0.8336	0.8995	(94)
Useful gains	543.2677	611.3001	621.6497	578.6029	479.0158	336.8285	228.7861	239.0662	358.1784	480.9871	517.4621	521.4520	(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	886.8255	871.3984	796.2037	666.4204	513.1422	345.1189	230.6499	241.6143	374.0359	565.7673	739.7313	879.1873	(97)
Space heating kWh	255.6070	174.7860	129.8682	63.2286	25.3900	0.0000	0.0000	0.0000	0.0000	63.0764	160.0338	266.1550	(98a)
Space heating requirement - total per year (kWh/year)												1138.1451	
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	255.6070	174.7860	129.8682	63.2286	25.3900	0.0000	0.0000	0.0000	0.0000	63.0764	160.0338	266.1550	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1138.1451	
Space heating per m2											(98c) / (4) =	18.4077	(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	255.6070	174.7860	129.8682	63.2286	25.3900	0.0000	0.0000	0.0000	0.0000	63.0764	160.0338	266.1550	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	276.9306	189.3673	140.7023	68.5034	27.5082	0.0000	0.0000	0.0000	0.0000	68.3385	173.3844	288.3587	(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	209.1578	184.9927	196.6987	173.4753	168.4968	152.2071	150.5447	156.3437	157.8510	175.5561	186.0903	206.9548	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5106	83.9327	83.1514	82.0206	80.8734	79.8000	79.8000	79.8000	79.8000	81.9967	83.7233	84.6250	(217)
Fuel for water heating, kWh/month	247.4928	220.4060	236.5548	211.5022	208.3465	190.7357	188.6525	195.9195	197.8082	214.1016	222.2681	244.5550	(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	18.6062	14.9266	13.4397	9.8465	7.6057	6.2139	6.9382	9.0185	11.7142	15.3696	17.3600	19.1233	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.6398	-24.6933	-37.3444	-44.2573	-49.7312	-47.1676	-46.6025	-42.9997	-36.9932	-29.2313	-18.7300	-14.2465	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.9930	-12.8846	-26.1301	-40.0175	-53.6694	-54.1924	-53.5449	-44.9810	-32.5128	-18.6664	-8.0788	-4.7180	(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												1233.0933	(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												2578.3430	(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)	150.1624	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-764.0257	(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	3283.5730	(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	1233.0933	0.2100	258.9496	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2578.3430	0.2100	541.4520	(264)
Space and water heating			800.4016	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	150.1624	0.1443	21.6731	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-408.6367	0.1335	-54.5582	
PV Unit electricity exported	-355.3889	0.1253	-44.5424	
Total			-99.1006	(269)
Total CO2, kg/year			734.9033	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8900	(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	1233.0933	1.1300	1393.3955	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2578.3430	1.1300	2913.5276	(278)
Space and water heating			4306.9230	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	150.1624	1.5338	230.3240	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-408.6367	1.4934	-610.2496	
PV Unit electricity exported	-355.3889	0.4600	-163.4919	
Total			-773.7415	(283)
Total Primary energy kWh/year			3893.6064	(286)
Target Primary Energy Rate (TPER)			62.9700	(287)