Full SAP Calculation Printout

Property Reference	Flat 2_Copy	**Issued on Date**	22/11/2023
Assessment Reference	001_Copy	**Prop Type Ref**	118 Malden Road
Property			

SAP Rating	82 B	**DER**	10.59	**TER**	11.75
Environmental	92 A	**% DER < TER**			9.87
CO_2 Emissions (t/year)	0.63	**DFEE**	30.34	**TFEE**	27.77
Compliance Check	See BREL	**% DFEE < TFEE**			-9.24
% DPER < TPER	-10.73	**DPER**	68.34	**TPER**	61.72

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	66.0000 (1b)	x	2.5000 (2b)	=	165.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	165.0000	(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)			27.3100	1.1450	31.2710			(27)
External Walls	57.5000	27.3100	30.1900	0.1800	5.4342	70.0000	2113.3000	(29a)
Total net area of external elements Aum(A, m2)			57.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.7052			(33)
Party Floor 1			66.0000			40.0000	2640.0000	(32d)
Party Ceiling 1			66.0000			30.0000	1980.0000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6733.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		102.0197 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	12.4000	0.0300	0.3720
E3 Sill	4.4000	0.0400	0.1760
E4 Jamb	27.2000	0.0500	1.3600
E18 Party wall between dwellings	5.0000	0.0600	0.3000

E7 Party floor between dwellings (in blocks of flats)	46.0000	0.0700	3.2200	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P1 Party wall - Ground floor	9.8000	0.0320	0.3136	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1916 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.8968 (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	14.2693	14.0957	13.9222	13.0544	12.8808	12.0130	12.0130	11.8395	12.3601	12.8808	13.2279	13.5751	(38)
Heat transfer coeff	57.1661	56.9925	56.8190	55.9512	55.7776	54.9098	54.9098	54.7363	55.2569	55.7776	56.1247	56.4719	(39)
Average = Sum(39)m / 12 =												55.9078	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8662	0.8635	0.8609	0.8477	0.8451	0.8320	0.8320	0.8293	0.8372	0.8451	0.8504	0.8556	(40)
HLP (average)												0.8471	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1452 (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

69.3767	68.3463	66.8954	64.2201	62.2169	59.9957	58.7959	60.2367	61.8054	64.1822	66.9126	69.1421	(42b)

Hot water usage for other uses

36.5995	35.2686	33.9377	32.6068	31.2759	29.9450	29.9450	31.2759	32.6068	33.9377	35.2686	36.5995	(42c)

Average daily hot water use (litres/day) 97.5953 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9761	103.6149	100.8331	96.8269	93.4928	89.9407	88.7409	91.5126	94.4122	98.1199	102.1811	105.7416	(44)
Energy conte	167.8403	147.5462	154.9767	132.5512	125.8593	110.5926	107.3244	113.3117	116.4197	133.1478	145.5758	165.5658	(45)
Energy content (annual)										Total = Sum(45)m =		1620.7112	
Distribution loss (46)m = 0.15 x (45)m	25.1760	22.1319	23.2465	19.8827	18.8789	16.5889	16.0987	16.9967	17.4630	19.9722	21.8364	24.8349	(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	218.7992	193.5736	205.9356	181.8663	176.8182	159.9076	158.2833	164.2706	165.7348	184.1067	194.8908	216.5247	(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	218.7992	193.5736	205.9356	181.8663	176.8182	159.9076	158.2833	164.2706	165.7348	184.1067	194.8908	216.5247	(64)
										Total per year (kWh/year) = Sum(64)m =		2220.7112	(64)
12Total per year (kWh/year)												2221	(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	68.5466	60.5660	64.2695	56.4020	54.5879	49.1008	48.4251	50.4159	51.0383	57.0114	60.7327	67.7903	(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	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.7172	104.8655	94.7172	97.8745	94.7172	97.8745	94.7172	94.7172	97.8745	94.7172	97.8745	94.7172	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.7875	189.7362	184.8256	174.3717	161.1755	148.7729	140.4872	138.5386	143.4491	153.9031	167.0993	179.5018	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	(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)	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	(71)
Water heating gains (Table 5)	92.1325	90.1279	86.3837	78.3362	73.3709	68.1955	65.0875	67.7632	70.8865	76.6282	84.3510	91.1160	(72)
Total internal gains	432.8160	442.9083	424.1053	408.7610	387.4423	370.0216	355.4706	356.1978	367.3888	383.4271	407.5034	423.5138	(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	3.6400	10.6334	0.7200	0.7000	0.7700	13.5188	(74)
East	11.1700	19.6403	0.7200	0.7000	0.7700	76.6239	(76)
South	12.5000	46.7521	0.7200	0.7000	0.7700	204.1148	(78)

Solar gains	294.2575	510.0152	716.5748	911.8058	1037.7218	1035.9934	996.5113	902.6472	784.7033	569.1739	354.1638	250.6557	(83)
Total gains	727.0735	952.9235	1140.6801	1320.5668	1425.1641	1406.0151	1351.9819	1258.8450	1152.0922	952.6011	761.6672	674.1695	(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	32.7180	32.8176	32.9179	33.4284	33.5325	34.0624	34.0624	34.1704	33.8484	33.5325	33.3251	33.1202	
alpha	3.1812	3.1878	3.1945	3.2286	3.2355	3.2708	3.2708	3.2780	3.2566	3.2355	3.2217	3.2080	
util living area													
	0.8525	0.7466	0.6270	0.4819	0.3551	0.2479	0.1782	0.1992	0.3248	0.5544	0.7722	0.8732	(86)
MIT	20.0543	20.3804	20.6276	20.8012	20.8724	20.8987	20.9041	20.9035	20.8875	20.7722	20.4148	19.9874	(87)
Th 2	20.1964	20.1986	20.2009	20.2121	20.2144	20.2257	20.2257	20.2280	20.2212	20.2144	20.2099	20.2054	(88)
util rest of house													
	0.8379	0.7264	0.6024	0.4550	0.3268	0.2185	0.1470	0.1661	0.2897	0.5209	0.7498	0.8600	(89)
MIT 2	19.0976	19.4894	19.7795	19.9847	20.0625	20.0994	20.1040	20.1059	20.0854	19.9611	19.5482	19.0237	(90)
Living area fraction										fLA = Living area / (4) =		0.5576	(91)
MIT	19.6310	19.9862	20.2524	20.4399	20.5141	20.5451	20.5501	20.5506	20.5326	20.4134	20.0314	19.5610	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6310	19.9862	20.2524	20.4399	20.5141	20.5451	20.5501	20.5506	20.5326	20.4134	20.0314	19.5610	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8265	0.7207	0.6040	0.4629	0.3377	0.2307	0.1601	0.1799	0.3039	0.5296	0.7444	0.8482	(94)
Useful gains	600.9268	686.7945	688.9874	611.2524	481.2255	324.3261	216.4419	226.5102	350.0739	504.4928	566.9767	571.8277	(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													
	876.4150	859.8018	781.3963	645.6733	491.6290	326.4426	216.9001	227.1906	355.4481	547.3654	725.7700	867.4658	(97)
Space heating kWh													
	204.9632	116.2609	68.7522	24.7831	7.7402	0.0000	0.0000	0.0000	0.0000	31.8972	114.3312	219.9548	(98a)
Space heating requirement - total per year (kWh/year)												788.6828	
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													
	204.9632	116.2609	68.7522	24.7831	7.7402	0.0000	0.0000	0.0000	0.0000	31.8972	114.3312	219.9548	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												788.6828	
Space heating per m2											(98c) / (4) =	11.9497	(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													
	204.9632	116.2609	68.7522	24.7831	7.7402	0.0000	0.0000	0.0000	0.0000	31.8972	114.3312	219.9548	(98)
Space heating efficiency (main heating system 1)													
	90.0000	90.0000	90.0000	90.0000	90.0000	0.0000	0.0000	0.0000	0.0000	90.0000	90.0000	90.0000	(210)
Space heating fuel (main heating system)													
	227.7369	129.1788	76.3914	27.5368	8.6003	0.0000	0.0000	0.0000	0.0000	35.4413	127.0346	244.3942	(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													
	218.7992	193.5736	205.9356	181.8663	176.8182	159.9076	158.2833	164.2706	165.7348	184.1067	194.8908	216.5247	(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													
	186.4892	163.9402	172.1963	147.2791	139.8437	122.8806	119.2493	125.9018	129.3552	147.9420	161.7508	183.9620	(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	68.3073	61.6969	68.3073	66.1039	68.3073	66.1039	68.3073	68.3073	66.1039	68.3073	66.1039	68.3073	(231)
Lighting	21.7170	17.4222	15.6867	11.4928	8.8773	7.2529	8.0982	10.5264	13.6727	17.9393	20.2624	22.3205	(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	876.3142	(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	1800.7903	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	118.2637	(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	804.2637	(231)
Electricity for lighting (calculated in Appendix L)	175.2683	(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 3656.6366 (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	876.3142	0.2100	184.0260	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1800.7903	0.2100	378.1660	(264)
Space and water heating			562.1920	(265)
Pumps, fans and electric keep-hot	804.2637	0.1387	111.5613	(267)
Energy for lighting	175.2683	0.1443	25.2966	(268)
Total CO2, kg/year			699.0499	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.5900	(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	876.3142	1.1300	990.2351	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1800.7903	1.1300	2034.8930	(278)
Space and water heating			3025.1281	(279)
Pumps, fans and electric keep-hot	804.2637	1.5128	1216.6902	(281)
Energy for lighting	175.2683	1.5338	268.8324	(282)
Total Primary energy kWh/year			4510.6507	(286)
Dwelling Primary energy Rate (DPER)			68.3400	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	66.0000	(1b)	x 2.5000	(2b) =	165.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	165.0000	(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	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) =	0.1212	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3712	(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) =	0.3155	(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	0.4023	0.3944	0.3865	0.3471	0.3392	0.2998	0.2998	0.2919	0.3155	0.3392	0.3550	0.3707	(22b)
Effective ac	0.5809	0.5778	0.5747	0.5602	0.5575	0.5449	0.5449	0.5426	0.5498	0.5575	0.5630	0.5687	(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	
TER Opening Type (Uw = 1.20)			16.5000	1.1450	18.8931			(27)
External Walls	57.5000	16.5000	41.0000	0.1800	7.3800			(29a)
Total net area of external elements Aum(A, m2)			57.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.2731			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 112.0197 (35)
List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	12.4000	0.0500	0.6200	
E3 Sill	4.4000	0.0500	0.2200	
E4 Jamb	27.2000	0.0500	1.3600	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E7 Party floor between dwellings (in blocks of flats)	46.0000	0.0700	3.2200	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P1 Party wall - Ground floor	9.8000	0.0800	0.7840	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.9540	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	33.2271	(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	31.6313	31.4602	31.2924	30.5047	30.3573	29.6712	29.6712	29.5442	29.9355	30.3573	30.6555	30.9672	(38)
Heat transfer coeff	64.8584	64.6873	64.5196	63.7318	63.5845	62.8984	62.8984	62.7713	63.1626	63.5845	63.8826	64.1943	(39)
Average = Sum(39)m / 12 =												63.7311	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9827	0.9801	0.9776	0.9656	0.9634	0.9530	0.9530	0.9511	0.9570	0.9634	0.9679	0.9726	(40)
HLP (average)												0.9656	
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 2.1452 (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

69.3767	68.3463	66.8954	64.2201	62.2169	59.9957	58.7959	60.2367	61.8054	64.1822	66.9126	69.1421	(42b)

Hot water usage for other uses

36.5995	35.2686	33.9377	32.6068	31.2759	29.9450	29.9450	31.2759	32.6068	33.9377	35.2686	36.5995	(42c)

Average daily hot water use (litres/day) 97.5953 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9761	103.6149	100.8331	96.8269	93.4928	89.9407	88.7409	91.5126	94.4122	98.1199	102.1811	105.7416	(44)
Energy conte	167.8403	147.5462	154.9767	132.5512	125.8593	110.5926	107.3244	113.3117	116.4197	133.1478	145.5758	165.5658	(45)
Energy content (annual)										Total = Sum(45)m =		1620.7112	
Distribution loss (46)m = 0.15 x (45)m	25.1760	22.1319	23.2465	19.8827	18.8789	16.5889	16.0987	16.9967	17.4630	19.9722	21.8364	24.8349	(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	47.7503	47.6429	44.3543	45.2214	46.6338	46.5594	50.0008	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	218.7992	193.5736	205.9356	180.3015	173.5022	154.9469	152.5458	159.9455	162.9791	183.1486	194.8908	216.5247	(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	218.7992	193.5736	205.9356	180.3015	173.5022	154.9469	152.5458	159.9455	162.9791	183.1486	194.8908	216.5247	(64)
									Total per year (kWh/year) = Sum(64)m =			2197.0933	(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	68.5466	60.5660	64.2695	56.0108	53.7589	47.8606	46.9907	49.3346	50.3494	56.7718	60.7327	67.7903	(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	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.7172	104.8655	94.7172	97.8745	94.7172	97.8745	94.7172	94.7172	97.8745	94.7172	97.8745	94.7172	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.7875	189.7362	184.8256	174.3717	161.1755	148.7729	140.4872	138.5386	143.4491	153.9031	167.0993	179.5018	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	(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)	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	(71)
Water heating gains (Table 5)	92.1325	90.1279	86.3837	77.7928	72.2566	66.4731	63.1596	66.3099	69.9297	76.3062	84.3510	91.1160	(72)
Total internal gains	432.8160	442.9083	424.1053	408.2177	386.3281	368.2991	353.5427	354.7444	366.4320	383.1052	407.5034	423.5138	(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	2.2000	10.6334	0.6300	0.7000	0.7700	7.1493	(74)
East	6.7500	19.6403	0.6300	0.7000	0.7700	40.5157	(76)
South	7.5500	46.7521	0.6300	0.7000	0.7700	107.8747	(78)

Solar gains	155.5397	269.5909	378.7892	482.0074	548.5836	547.6752	526.8009	477.1712	414.8086	300.8653	187.2062	132.4918	(83)
Total gains	588.3557	712.4992	802.8944	890.2251	934.9116	915.9743	880.3436	831.9156	781.2407	683.9705	594.7096	556.0056	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.6643	31.7480	31.8306	32.2240	32.2987	32.6510	32.6510	32.7171	32.5144	32.2987	32.1479	31.9918	
alpha	3.1110	3.1165	3.1220	3.1483	3.1532	3.1767	3.1767	3.1811	3.1676	3.1532	3.1432	3.1328	
util living area													
	0.9255	0.8776	0.8119	0.7020	0.5681	0.4208	0.3089	0.3392	0.5153	0.7463	0.8843	0.9350	(86)
MIT	19.3594	19.7311	20.1343	20.5519	20.8153	20.9473	20.9851	20.9797	20.8978	20.5374	19.8916	19.2926	(87)
Th 2	20.0978	20.0999	20.1021	20.1121	20.1139	20.1227	20.1227	20.1243	20.1193	20.1139	20.1102	20.1062	(88)
util rest of house													
	0.9156	0.8626	0.7900	0.6701	0.5255	0.3682	0.2493	0.2774	0.4598	0.7108	0.8676	0.9262	(89)
MIT 2	18.1984	18.6577	19.1493	19.6482	19.9421	20.0829	20.1145	20.1125	20.0366	19.6465	18.8720	18.1211	(90)
Living area fraction										fLA = Living area / (4) =		0.5576	(91)
MIT	18.8457	19.2562	19.6985	20.1521	20.4290	20.5649	20.5999	20.5961	20.5168	20.1433	19.4405	18.7743	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8457	19.2562	19.6985	20.1521	20.4290	20.5649	20.5999	20.5961	20.5168	20.1433	19.4405	18.7743	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8989	0.8465	0.7792	0.6716	0.5410	0.3951	0.2819	0.3110	0.4854	0.7120	0.8530	0.9101	(94)
Useful gains	528.8449	603.1327	625.6190	597.9155	505.8205	361.8601	248.2086	258.7152	379.2119	486.9948	507.2875	505.9999	(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													
	943.4133	928.6663	851.5621	717.1157	555.0265	375.1805	251.5879	263.3917	405.3006	606.8034	788.3445	935.5873	(97)
Space heating kWh													
	308.4389	218.7585	168.1017	85.8241	36.6093	0.0000	0.0000	0.0000	0.0000	89.1376	202.3610	319.6131	(98a)
Space heating requirement - total per year (kWh/year)												1428.8443	
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													
	308.4389	218.7585	168.1017	85.8241	36.6093	0.0000	0.0000	0.0000	0.0000	89.1376	202.3610	319.6131	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1428.8443	
Space heating per m2											(98c) / (4) =	21.6492	(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													
	308.4389	218.7585	168.1017	85.8241	36.6093	0.0000	0.0000	0.0000	0.0000	89.1376	202.3610	319.6131	(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)													
	333.8083	236.7517	181.9282	92.8832	39.6205	0.0000	0.0000	0.0000	0.0000	96.4693	219.0054	345.9016	(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													
	218.7992	193.5736	205.9356	180.3015	173.5022	154.9469	152.5458	159.9455	162.9791	183.1486	194.8908	216.5247	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.1170	84.6442	83.9498	82.8858	81.6767	80.3000	80.3000	80.3000	80.3000	82.9262	84.4622	85.2142	(217)
Fuel for water heating, kWh/month													
	257.0570	228.6909	245.3079	217.5299	212.4256	192.9600	189.9698	199.1849	202.9628	220.8574	230.7433	254.0944	(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	19.6804	15.7883	14.2156	10.4150	8.0448	6.5727	7.3388	9.5392	12.3905	16.2570	18.3622	20.2273	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-22.5010	-32.7732	-48.6580	-56.5782	-62.6404	-59.0743	-58.3595	-54.2916	-47.3833	-38.3122	-25.1111	-19.3333	(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	-9.7113	-20.7098	-41.6826	-63.3665	-84.5252	-85.1871	-84.1760	-70.9276	-51.5416	-29.8587	-13.0448	-7.6580	(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												1546.3682	(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												2651.7840	(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)												158.8319	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1087.4051	(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	3355.5789	(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	1546.3682	0.2100	324.7373	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2651.7840	0.2100	556.8746	(264)
Space and water heating			881.6120	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.8319	0.1443	22.9243	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-525.0160	0.1339	-70.2971	
PV Unit electricity exported	-562.3891	0.1255	-70.6051	
Total			-140.9022	(269)
Total CO2, kg/year			775.5634	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7500	(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	1546.3682	1.1300	1747.3961	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2651.7840	1.1300	2996.5159	(278)
Space and water heating			4743.9120	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.8319	1.5338	243.6216	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-525.0160	1.4948	-784.8015	
PV Unit electricity exported	-562.3891	0.4608	-259.1601	
Total			-1043.9616	(283)
Total Primary energy kWh/year			4073.6728	(286)
Target Primary Energy Rate (TPER)			61.7200	(287)