Full SAP Calculation Printout

Property Reference	Apartment 1	**Issued on Date**	21/12/2023
Assessment Reference	Apartment 1 Baseline	**Prop Type Ref**	Apartment 1
Property	Apartment 1, 95, Avenue Road, London, NW8 6HY		

SAP Rating	68 D	**DER**	36.14	**TER**	19.63
Environmental	67 D	**% DER < TER**			-84.11
CO_2 Emissions (t/year)	3.02	**DFEE**	79.64	**TFEE**	38.79
Compliance Check	See BREL	**% DFEE < TFEE**			-105.33
% DPER < TPER	-86.99	**DPER**	197.50	**TPER**	105.62

Assessor Details	Mr. Graham Suttill	**Assessor ID**	P035-0001
Client	Carnell Warren Associates Ltd, Wendy Warren		

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		100.4400 (1b)	x	2.5100 (2b)	=	252.1044	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.4400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	252.1044	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1587	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9087	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6361	(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	0.8110	0.7951	0.7792	0.6997	0.6838	0.6043	0.6043	0.5884	0.6361	0.6838	0.7156	0.7474	(22b)
Effective ac	0.8288	0.8161	0.8036	0.7448	0.7338	0.6826	0.6826	0.6731	0.7023	0.7338	0.7560	0.7793	(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	
Windows (Uw = 1.60)			13.8700	1.5038	20.8571			(27)
Glazed Doors (Uw = 1.60)			13.6000	1.5038	20.4511			(27)
Basement Floor			100.4400	0.2500	25.1100	110.0000	11048.4000	(28a)
Retaining Walls	37.5500		37.5500	0.3000	11.2650	9.0000	337.9500	(29a)
Wall to Lightwells	44.4400	27.4700	16.9700	0.3000	5.0910	9.0000	152.7300	(29a)
Total net area of external elements Aum(A, m2)			182.4300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	82.7743			(33)
Wall to Corridor			29.9700	0.0000	0.0000	70.0000	2097.9000	(32)
Party Ceiling 1			100.4400			30.0000	3013.2000	(32b)
Internal Wall 1			173.3900			75.0000	13004.2500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	29654.4300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		295.2452	(35)
Thermal bridges (Default value 0.200 * total exposed area)		36.4860	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	119.2603	(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	68.9554	67.8931	66.8518	61.9607	61.0457	56.7857	56.7857	55.9968	58.4266	61.0457	62.8969	64.8323	(38)

Heat transfer coeff

	188.2157	187.1534	186.1120	181.2210	180.3059	176.0460	176.0460	175.2571	177.6869	180.3059	182.1572	184.0925 (39)
Average = Sum(39)m / 12 =												181.2166

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8739	1.8633	1.8530	1.8043	1.7952	1.7527	1.7527	1.7449	1.7691	1.7952	1.8136	1.8329	(40)
HLP (average)												1.8042	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7436 (42)

Hot water usage for mixer showers

	78.9978	77.8107	76.0807	72.7707	70.3281	67.6040	66.0557	67.7725	69.6545	72.5793	75.9604	78.6952 (42a)

Hot water usage for baths

	30.3202	29.8700	29.2358	28.0666	27.1912	26.2204	25.6960	26.3257	27.0113	28.0501	29.2433	30.2177 (42b)

Hot water usage for other uses

	42.7268	41.1731	39.6194	38.0657	36.5120	34.9583	34.9583	36.5120	38.0657	39.6194	41.1731	42.7268 (42c)

Average daily hot water use (litres/day) 139.7876 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	152.0449	148.8537	144.9359	138.9031	134.0312	128.7827	126.7100	130.6103	134.7316	140.2488	146.3769	151.6397	(44)
Energy conte	240.8020	211.9657	222.7611	190.1514	180.4318	158.3534	153.2448	161.7228	166.1375	190.3163	208.5407	237.4312	(45)
Energy content (annual)										Total = Sum(45)m =		2321.8586	
Distribution loss (46)m = 0.15 x (45)m													
	36.1203	31.7949	33.4142	28.5227	27.0648	23.7530	22.9867	24.2584	24.9206	28.5474	31.2811	35.6147	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.6000 (49)

Enter (49) or (54) in (55) 1.0800 (55)

Total storage loss

	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (56)

If cylinder contains dedicated solar storage

	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800 (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

	297.5444	263.2169	279.5035	245.0634	237.1742	213.2654	209.9872	218.4652	221.0495	247.0587	263.4527	294.1736 (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

	297.5444	263.2169	279.5035	245.0634	237.1742	213.2654	209.9872	218.4652	221.0495	247.0587	263.4527	294.1736 (64)
										Total per year (kWh/year) = Sum(64)m =		2989.9546 (64)
12Total per year (kWh/year)												2990 (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

	125.4606	111.4796	119.4620	107.1549	105.3875	96.5821	96.3478	99.1667	99.1703	108.6741	113.2694	124.3398 (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	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.6766	143.5705	129.6766	133.9991	129.6766	133.9991	129.6766	129.6766	133.9991	129.6766	133.9991	129.6766	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	257.0371	259.7044	252.9830	238.6740	220.6115	203.6353	192.2941	189.6269	196.3482	210.6572	228.7198	245.6960	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	(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)													
	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	(71)
Water heating gains (Table 5)													
	168.6298	165.8922	160.5672	148.8263	141.6499	134.1418	129.4997	133.2886	137.7366	146.0673	157.3186	167.1234	(72)
Total internal gains													
	619.4969	633.3205	607.3802	585.6529	556.0914	535.9297	515.6239	516.7455	532.2374	550.5546	584.1909	606.6494	(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	3.3600	10.6334	0.6300	0.7000	0.5400	7.6575	(74)
East	4.9200	19.6403	0.6300	0.7000	0.5400	20.7103	(76)
West	5.5900	19.6403	0.6300	0.7000	0.5400	23.5307	(80)
North	6.8200	10.6334	0.6300	0.7000	0.5400	15.5429	(74)
West	6.7800	19.6403	0.6300	0.7000	0.5400	28.5399	(80)

Solar gains	95.9812	186.7118	309.8105	462.9765	582.1049	603.5256	571.3676	480.1059	363.2820	221.7172	119.3698	79.1924	(83)
Total gains	715.4782	820.0324	917.1907	1048.6294	1138.1963	1139.4553	1086.9915	996.8514	895.5193	772.2717	703.5607	685.8417	(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	43.7654	44.0139	44.2601	45.4547	45.6854	46.7909	46.7909	47.0015	46.3588	45.6854	45.2211	44.7457
alpha	3.9177	3.9343	3.9507	4.0303	4.0457	4.1194	4.1194	4.1334	4.0906	4.0457	4.0147	3.9830
util living area												
	0.9977	0.9956	0.9907	0.9726	0.9220	0.8001	0.6510	0.7118	0.9065	0.9836	0.9958	0.9981 (86)

MIT	18.9663	19.1583	19.4970	20.0083	20.4687	20.8168	20.9430	20.9176	20.6480	20.0555	19.4536	18.9721	(87)
Th 2	19.4187	19.4260	19.4332	19.4670	19.4734	19.5033	19.5033	19.5088	19.4917	19.4734	19.4605	19.4471	(88)
util rest of house													
	0.9966	0.9937	0.9862	0.9580	0.8755	0.6804	0.4588	0.5252	0.8297	0.9721	0.9935	0.9972	(89)
MIT 2	17.1280	17.3780	17.8144	18.4793	19.0333	19.4072	19.4898	19.4855	19.2572	18.5508	17.7783	17.1532	(90)
Living area fraction										fLA = Living area / (4) =		0.2903	(91)
MIT	17.6617	17.8948	18.3029	18.9232	19.4500	19.8164	19.9117	19.9013	19.6610	18.9877	18.2647	17.6813	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6617	17.8948	18.3029	18.9232	19.4500	19.8164	19.9117	19.9013	19.6610	18.9877	18.2647	17.6813	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9948	0.9908	0.9813	0.9507	0.8746	0.7098	0.5164	0.5808	0.8410	0.9666	0.9907	0.9957	(94)
Useful gains	711.7512	812.4509	900.0110	996.9481	995.4346	808.7405	561.3461	579.0110	753.1056	746.4842	697.0401	682.8785	(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													
	2514.8817	2432.0276	2196.6588	1816.4162	1397.3752	918.3335	583.0041	613.6255	988.1145	1512.3457	2033.7215	2481.8022	(97)
Space heating kWh													
	1341.5291	1088.3556	964.7060	590.0170	299.0438	0.0000	0.0000	0.0000	0.0000	569.8009	962.4106	1338.3992	(98a)
Space heating requirement - total per year (kWh/year)												7154.2622	
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													
	1341.5291	1088.3556	964.7060	590.0170	299.0438	0.0000	0.0000	0.0000	0.0000	569.8009	962.4106	1338.3992	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7154.2622	
Space heating per m2											(98c) / (4) =	71.2292	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	1341.5291	1088.3556	964.7060	590.0170	299.0438	0.0000	0.0000	0.0000	0.0000	569.8009	962.4106	1338.3992	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50													
307a	2012.2937	1632.5334	1447.0589	885.0255	448.5657	0.0000	0.0000	0.0000	0.0000	854.7014	1443.6158	2007.5988	
Space heating requirement													
	2012.2937	1632.5334	1447.0589	885.0255	448.5657	0.0000	0.0000	0.0000	0.0000	854.7014	1443.6158	2007.5988	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	297.5444	263.2169	279.5035	245.0634	237.1742	213.2654	209.9872	218.4652	221.0495	247.0587	263.4527	294.1736	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50													
310a	446.3165	394.8254	419.2553	367.5951	355.7613	319.8981	314.9808	327.6978	331.5743	370.5881	395.1790	441.2604	
Water heating fuel													
	446.3165	394.8254	419.2553	367.5951	355.7613	319.8981	314.9808	327.6978	331.5743	370.5881	395.1790	441.2604	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(331)
Lighting	31.3329	25.1364	22.6325	16.5816	12.8081	10.4643	11.6840	15.1873	19.7267	25.8826	29.2343	32.2037	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)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	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)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	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)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	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)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	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)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	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)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	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												10731.3932	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4484.9319	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												107.3139	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(331)
Electricity for lighting (calculated in Appendix L)												252.8744	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												15469.1995	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367)
Space and Water heating from Boilers	17001.4806	0.2100	2517.9805	(367)
Electrical energy for heat distribution (space & water)	107.3139	0.0000	22.8994	(372)

Overall CO2 factor for heat network			0.2361 (386)
Total CO2 associated with community systems			3593.2103 (373)
Space and water heating			3593.2103 (376)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (378)
Energy for lighting	252.8744	0.1443	36.4976 (379)
Total CO2, kg/year			3629.7079 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			36.1400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Boilers			89.5000	(467a)
Space and Water heating from Boilers	17001.4806	1.1300	13549.1334	(467)
Electrical energy for heat distribution (space & water)	107.3139	0.0000	236.9143	(472)
Overall CO2 factor for heat network			1.2781	(486)
Total CO2 associated with community systems			19448.5875	(473)
Space and water heating			19448.5875	(476)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(478)
Energy for lighting	252.8744	1.5338	387.8671	(479)
Total Primary energy kWh/year			19836.4546	(483)
Dwelling Primary energy Rate (DPER)			197.5000	(484)

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	100.4400	(1b) x	2.5100	(2b) =	252.1044	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.4400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		252.1044	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1587	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4087	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2861	(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	0.3647	0.3576	0.3504	0.3147	0.3075	0.2718	0.2718	0.2646	0.2861	0.3075	0.3218	0.3361	(22b)
Effective ac	0.5665	0.5639	0.5614	0.5495	0.5473	0.5369	0.5369	0.5350	0.5409	0.5473	0.5518	0.5565	(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)			25.1100	1.1450	28.7519			(27)
Basement Floor			100.4400	0.1300	13.0572			(28a)
Retaining Walls	37.5500		37.5500	0.1800	6.7590			(29a)
Wall to Lightwells	44.4400	25.1100	19.3300	0.1800	3.4794			(29a)
Total net area of external elements Aum(A, m2)			182.4300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0475			(33)
Wall to Corridor			29.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	305.2452	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	9.1215	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.1690	(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	47.1309	46.9160	46.7054	45.7161	45.5310	44.6694	44.6694	44.5098	45.0013	45.5310	45.9055	46.2969	(38)
Heat transfer coeff	108.2999	108.0850	107.8744	106.8851	106.7000	105.8384	105.8384	105.6788	106.1703	106.7000	107.0745	107.4659	(39)

Average = Sum(39)m / 12 = 106.8842

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0783	1.0761	1.0740	1.0642	1.0623	1.0537	1.0537	1.0522	1.0571	1.0623	1.0661	1.0700	(40)
HLP (average)												1.0642	
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 2.7436 (42)

Hot water usage for mixer showers													
	70.2203	69.1650	67.6273	64.6851	62.5138	60.0925	58.7161	60.2423	61.9151	64.5150	67.5204	69.9513	(42a)
Hot water usage for baths													
	30.3202	29.8700	29.2358	28.0666	27.1912	26.2204	25.6960	26.3257	27.0113	28.0501	29.2433	30.2177	(42b)
Hot water usage for other uses													
	42.7268	41.1731	39.6194	38.0657	36.5120	34.9583	34.9583	36.5120	38.0657	39.6194	41.1731	42.7268	(42c)

Average daily hot water use (litres/day) 131.6950 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.2674	140.2081	136.4825	130.8174	126.2170	121.2712	119.3705	123.0800	126.9922	132.1845	137.9368	142.8958	(44)
Energy conte	226.9005	199.6545	209.7686	179.0825	169.9123	149.1170	144.3683	152.3987	156.5941	179.3731	196.5163	223.7403	(45)
Energy content (annual)										Total = Sum(45)m =		2187.4262	
Distribution loss (46)m = 0.15 x (45)m													
	34.0351	29.9482	31.4653	26.8624	25.4869	22.3676	21.6552	22.8598	23.4891	26.9060	29.4774	33.5610	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												1.4400	(55)
Total storage loss													
	44.6400	40.3200	44.6400	43.2000	44.6400	43.2000	44.6400	44.6400	43.2000	44.6400	43.2000	44.6400	(56)
If cylinder contains dedicated solar storage													
	44.6400	40.3200	44.6400	43.2000	44.6400	43.2000	44.6400	44.6400	43.2000	44.6400	43.2000	44.6400	(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													
	271.5405	239.9745	254.4086	222.2825	214.5523	192.3170	189.0083	197.0387	199.7941	224.0131	239.7163	268.3803	(62)
WWHRS	-32.1018	-28.3911	-29.7295	-24.6172	-22.9424	-19.6319	-18.4018	-19.5685	-20.3120	-23.9456	-27.1274	-31.5073	(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													
	239.4387	211.5834	224.6791	197.6653	191.6100	172.6851	170.6065	177.4702	179.4821	200.0675	212.5889	236.8730	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.7498	(64)
12Total per year (kWh/year)												2415	(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													
	111.1564	98.6411	105.4600	94.1049	92.2079	84.1414	83.7144	86.3846	86.6275	95.3535	99.9017	110.1057	(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	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	137.1781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	130.4399	144.4156	130.4399	134.7879	130.4399	134.7879	130.4399	130.4399	134.7879	130.4399	134.7879	130.4399	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	257.0371	259.7044	252.9830	238.6740	220.6115	203.6353	192.2941	189.6269	196.3482	210.6572	228.7198	245.6960	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	36.7178	(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)													
	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	-109.7425	(71)
Water heating gains (Table 5)													
	149.4038	146.7874	141.7474	130.7013	123.9353	116.8631	112.5194	116.1083	120.3160	128.1634	138.7523	147.9915	(72)
Total internal gains													
	601.0343	615.0608	589.3237	568.3167	539.1401	519.4397	499.4069	500.3285	515.6056	533.4139	566.4134	588.2808	(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	9.3000	10.6334	0.6300	0.7000	0.5400	21.1948	(74)
East	4.5000	19.6403	0.6300	0.7000	0.5400	18.9424	(76)
West	11.3100	19.6403	0.6300	0.7000	0.5400	47.6085	(80)

Solar gains	87.7457	170.6921	283.2275	423.2441	532.1397	551.7171	522.3216	438.9002	332.1090	202.6939	109.1277	72.3973	(83)
Total gains	688.7800	785.7529	872.5512	991.5607	1071.2799	1071.1568	1021.7285	939.2288	847.7145	736.1078	675.5411	660.6781	(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	78.6366	78.7930	78.9468	79.6775	79.8157	80.4655	80.4655	80.5870	80.2140	79.8157	79.5366	79.2469	
alpha	6.2424	6.2529	6.2631	6.3118	6.3210	6.3644	6.3644	6.3725	6.3476	6.3210	6.3024	6.2831	
util living area													
	0.9985	0.9962	0.9884	0.9491	0.8282	0.6193	0.4541	0.5138	0.7935	0.9735	0.9962	0.9989	(86)
MIT	19.9702	20.1201	20.3548	20.6757	20.9032	20.9871	20.9984	20.9967	20.9448	20.6380	20.2494	19.9462	(87)
Th 2	20.0186	20.0204	20.0221	20.0302	20.0317	20.0388	20.0388	20.0401	20.0361	20.0317	20.0287	20.0254	(88)
util rest of house													

	0.9979	0.9946	0.9835	0.9283	0.7715	0.5326	0.3559	0.4088	0.7107	0.9586	0.9944	0.9984	(89)
MIT 2	18.8220	19.0147	19.3137	19.7122	19.9579	20.0327	20.0384	20.0392	20.0032	19.6763	19.1870	18.7965	(90)
Living area fraction									fLA = Living area / (4) =			0.2903	(91)
MIT	19.1553	19.3356	19.6159	19.9919	20.2323	20.3098	20.3171	20.3172	20.2766	19.9555	19.4954	19.1302	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1553	19.3356	19.6159	19.9919	20.2323	20.3098	20.3171	20.3172	20.2766	19.9555	19.4954	19.1302	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9971	0.9931	0.9809	0.9274	0.7843	0.5576	0.3845	0.4394	0.7331	0.9571	0.9930	0.9978	(94)
Useful gains	686.8011	780.3664	855.8516	919.5335	840.1908	597.3158	392.8558	412.7089	621.4652	704.5279	670.8051	659.2023	(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													
	1608.8320	1560.2734	1414.8734	1185.5590	910.4007	604.3128	393.4132	413.9627	655.7686	998.2306	1327.2329	1604.4922	(97)
Space heating kWh													
	685.9909	524.0975	415.9122	191.5384	52.2361	0.0000	0.0000	0.0000	0.0000	218.5148	472.6280	703.2957	(98a)
Space heating requirement - total per year (kWh/year)												3264.2137	
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													
	685.9909	524.0975	415.9122	191.5384	52.2361	0.0000	0.0000	0.0000	0.0000	218.5148	472.6280	703.2957	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3264.2137	
Space heating per m2											(98c) / (4) =	32.4991	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	685.9909	524.0975	415.9122	191.5384	52.2361	0.0000	0.0000	0.0000	0.0000	218.5148	472.6280	703.2957	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50													
307a	1028.9864	786.1463	623.8684	287.3075	78.3542	0.0000	0.0000	0.0000	0.0000	327.7722	708.9420	1054.9435	
Space heating requirement													
	1028.9864	786.1463	623.8684	287.3075	78.3542	0.0000	0.0000	0.0000	0.0000	327.7722	708.9420	1054.9435	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	239.4387	211.5834	224.6791	197.6653	191.6100	172.6851	170.6065	177.4702	179.4821	200.0675	212.5889	236.8730	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50													
310a	359.1581	317.3751	337.0186	296.4980	287.4150	259.0277	255.9097	266.2054	269.2231	300.1012	318.8833	355.3095	
Water heating fuel													
	359.1581	317.3751	337.0186	296.4980	287.4150	259.0277	255.9097	266.2054	269.2231	300.1012	318.8833	355.3095	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(331)
Lighting	27.1028	21.7429	19.5771	14.3430	11.0789	9.0516	10.1066	13.1369	17.0636	22.3883	25.2876	27.8561	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.1020	-20.0685	-31.3000	-38.2673	-44.0180	-42.0799	-41.5416	-37.8162	-31.8011	-24.2152	-14.9515	-11.1476	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)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	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)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	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-3.2384	-7.0620	-14.5273	-22.5773	-30.6350	-31.0999	-30.7628	-25.7041	-18.3808	-10.3661	-4.4039	-2.5444	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)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	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)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	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												4896.3205	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3622.1246	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												48.9632	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(331)
Electricity for lighting (calculated in Appendix L)												218.7354	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-551.6110	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												8185.5696	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367)
Space and Water heating from Boilers	9517.8158	0.2100	1148.8573	(367)
Electrical energy for heat distribution (space & water)	48.9632	0.0000	12.7423	(372)
Overall CO2 factor for heat network			0.2361	(386)
Total CO2 associated with community systems			2011.4836	(373)
Space and water heating			2011.4836	(376)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(378)

Energy for lighting	218.7354	0.1443	31.5703	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.3089	0.1329	-46.5619	
PV Unit electricity exported	-201.3020	0.1249	-25.1402	
Total			-71.7021	(380)
Total CO2, kg/year			1971.3517	(383)
EPC Target Carbon Dioxide Emission Rate (TER)			19.6300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Boilers			89.5000	(467a)
Space and Water heating from Boilers	9517.8158	1.1300	6181.9466	(467)
Electrical energy for heat distribution (space & water)	48.9632	0.0000	132.3357	(472)
Overall CO2 factor for heat network			1.2781	(486)
Total CO2 associated with community systems			10887.4676	(473)
Space and water heating			10887.4676	(476)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(478)
Energy for lighting	218.7354	1.5338	335.5037	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.3089	1.4911	-522.3604	
PV Unit electricity exported	-201.3020	0.4584	-92.2714	
Total			-614.6318	(480)
Total Primary energy kWh/year			10608.3395	(483)
Target Primary Energy Rate (TPER)			105.6200	(484)