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Property Reference	L02.02 x1_Copy_Copy	Issued on Date	12/09/2023
Assessment Reference	L02.02 x1_Copy_Copy	Prop Type Ref	
Property			

SAP Rating	87 B	DER	1.70	TER	10.15
Environmental	98 A	% DER < TER			83.25
CO_2 Emissions (t/year)	0.17	DFEE	23.27	TFEE	30.66
Compliance Check	See BREL	% DFEE < TFEE			24.11
% DPER < TPER	67.78	DPER	17.36	TPER	53.88

Assessor Details	Mr. Richard Denteh	Assessor ID	U148-0001
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	61.9000 (1b)	x	2.5000 (2b)	=	154.7500 (1b)	-
First floor	61.8000 (1c)	x	2.9500 (2c)	=	182.3100 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 123.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		337.0600	(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	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388	(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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	(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) =	43.0000	(23c)

Effective ac	0.4619	0.4584	0.4550	0.4376	0.4342	0.4168	0.4168	0.4133	0.4238	0.4342	0.4411	0.4480	(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	
window (Uw = 0.80)			23.5000	0.7752	18.2171			(27)
External Wall 1	127.4340	23.5000	103.9340	0.1300	13.5114	190.0000	19747.4600	(29a)

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External Roof 1	8.0000	8.0000	0.1000	0.8000	9.0000	72.0000 (30)
Total net area of external elements Aum(A, m2)		135.4340				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		32.5285		(33)
Party Wall 1		67.3000	0.0000	0.0000	180.0000	12114.0000 (32)
Party Floor 1		61.9000			40.0000	2476.0000 (32d)
Party Ceiling 1		53.8000			30.0000	1614.0000 (32b)
Internal Wall 1		221.5800			9.0000	1994.2200 (32c)
Internal Floor 1		61.8000			18.0000	1112.4000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	39130.0800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	316.3305 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	17.1500	0.0500	0.8575
E3 Sill	15.5700	0.0500	0.7785
E4 Jamb	33.5200	0.0500	1.6760
E6 Intermediate floor within a dwelling	23.5000	0.0000	0.0000
E16 Corner (normal)	16.2000	0.0900	1.4580
E18 Party wall between dwellings	10.8000	0.0600	0.6480
E7 Party floor between dwellings (in blocks of flats)	36.1000	0.0700	2.5270
E24 Eaves (insulation at ceiling level - inverted)	4.1000	0.1500	0.6150
E14 Flat roof	8.1000	0.0800	0.6480

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.2080	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	41.7365	(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	51.3777	50.9919	50.6061	48.6769	48.2911	46.3620	46.3620	45.9761	47.1336	48.2911	49.0628	49.8344	(38)
Heat transfer coeff	93.1142	92.7284	92.3426	90.4134	90.0276	88.0984	88.0984	87.7126	88.8701	90.0276	90.7992	91.5709	(39)
Average = Sum(39)m / 12 =												90.3170	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7527	0.7496	0.7465	0.7309	0.7278	0.7122	0.7122	0.7091	0.7184	0.7278	0.7340	0.7403	(40)
HLP (average)												0.7301	
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	2.8765	(42)

Hot water usage for mixer showers

	99.6188	98.1217	95.9402	91.7662	88.6859	85.2508	83.2983	85.4634	87.8366	91.5249	95.7885	99.2371	(42a)

Hot water usage for baths

	31.2791	30.8146	30.1604	28.9542	28.0511	27.0496	26.5087	27.1583	27.8655	28.9372	30.1682	31.1734	(42b)

Hot water usage for other uses

	44.0887	42.4855	40.8823	39.2790	37.6758	36.0726	36.0726	37.6758	39.2790	40.8823	42.4855	44.0887	(42c)
Average daily hot water use (litres/day)												160.9265	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	174.9867	171.4218	166.9829	159.9995	154.4128	148.3730	145.8796	150.2974	154.9812	161.3443	168.4422	174.4992	(44)
Energy conte	277.1361	244.1024	256.6465	219.0313	207.8694	182.4420	176.4287	186.0996	191.1073	218.9427	239.9767	273.2236	(45)
Energy content (annual)										Total = Sum(45)m =		2673.0063	
Distribution loss (46)m = 0.15 x (45)m	41.5704	36.6154	38.4970	32.8547	31.1804	27.3663	26.4643	27.9149	28.6661	32.8414	35.9965	40.9835	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(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	332.4129	294.0298	311.9233	272.5250	263.1462	235.9356	231.7055	241.3764	244.6010	274.2195	293.4704	328.5004	(62)
WWHRS	-75.5667	-66.8318	-69.9824	-57.9482	-54.0057	-46.2130	-43.3174	-46.0637	-47.8138	-56.3672	-63.8572	-74.1673	(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	256.8462	227.1980	241.9408	214.5768	209.1405	189.7226	188.3882	195.3127	196.7872	217.8523	229.6132	254.3331	(64)
								Total per year (kWh/year) = Sum(64)m =				2621.7116	(64)
12Total per year (kWh/year)												2622	(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	136.3692	121.1060	129.5564	115.6229	113.3380	103.4569	102.8840	106.0996	106.3381	117.0199	122.5872	135.0683	(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	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	148.1891	164.0665	148.1891	153.1287	148.1891	153.1287	148.1891	148.1891	153.1287	148.1891	153.1287	148.1891	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	289.9549	292.9638	285.3816	269.2401	248.8644	229.7141	216.9205	213.9117	221.4939	237.6353	258.0111	277.1614	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	(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)													
	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	(71)
Water heating gains (Table 5)													
	183.2919	180.2172	174.1349	160.5873	152.3360	143.6901	138.2849	142.6069	147.6918	157.2848	170.2600	181.5434	(72)
Total internal gains													
	687.5842	703.3957	673.8539	649.1044	615.5377	592.6812	569.5428	570.8559	588.4626	609.2574	647.5480	673.0421	(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	4.3000	10.6334	0.5000	0.8000	0.7700	12.6746	(74)
Southeast	5.7500	36.7938	0.5000	0.8000	0.7700	58.6457	(77)
South	6.3000	46.7521	0.5000	0.8000	0.7700	81.6459	(78)
West	7.1500	19.6403	0.5000	0.8000	0.7700	38.9266	(80)

Solar gains	191.8928	333.9808	473.5751	610.8722	703.5031	706.1699	677.6496	607.8365	521.2642	373.8195	231.1949	163.3156	(83)
Total gains	879.4770	1037.3765	1147.4289	1259.9766	1319.0408	1298.8511	1247.1923	1178.6924	1109.7269	983.0769	878.7429	836.3577	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	116.7326	117.2183	117.7081	120.2196	120.7348	123.3786	123.3786	123.9214	122.3073	120.7348	119.7088	118.7000	
alpha	8.7822	8.8146	8.8472	9.0146	9.0490	9.2252	9.2252	9.2614	9.1538	9.0490	8.9806	8.9133	
util living area													
	0.9971	0.9873	0.9533	0.8260	0.6309	0.4340	0.3108	0.3423	0.5515	0.8771	0.9879	0.9980	(86)
MIT	20.4833	20.6427	20.8130	20.9593	20.9961	20.9999	21.0000	21.0000	20.9991	20.9434	20.6989	20.4628	(87)
Th 2	20.2945	20.2972	20.2999	20.3136	20.3164	20.3301	20.3301	20.3328	20.3246	20.3164	20.3109	20.3054	(88)
util rest of house													
	0.9960	0.9829	0.9389	0.7907	0.5861	0.3886	0.2635	0.2927	0.4981	0.8404	0.9829	0.9972	(89)
MIT 2	19.6948	19.8980	20.1071	20.2786	20.3138	20.3300	20.3301	20.3328	20.3241	20.2687	19.9815	19.6777	(90)
Living area fraction									fLA = Living area / (4) =			0.2211	(91)
MIT	19.8691	20.0626	20.2632	20.4291	20.4646	20.4781	20.4782	20.4803	20.4733	20.4179	20.1402	19.8513	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8691	20.0626	20.2632	20.4291	20.4646	20.4781	20.4782	20.4803	20.4733	20.4179	20.1402	19.8513	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9951	0.9811	0.9380	0.7969	0.5959	0.3987	0.2739	0.3036	0.5099	0.8463	0.9813	0.9966	(94)
Useful gains	875.1513	1017.7379	1076.3024	1004.0512	786.0089	517.7898	341.6611	357.8926	565.8116	832.0020	862.3397	833.4798	(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													
	1449.7081	1406.0071	1270.9281	1042.3826	789.0592	517.8542	341.6627	357.8966	566.4000	883.8812	1184.0366	1433.2022	(97)
Space heating kWh													
	427.4702	260.9169	144.8015	27.5986	2.2694	0.0000	0.0000	0.0000	0.0000	38.5981	231.6217	446.1935	(98a)
Space heating requirement - total per year (kWh/year)												1579.4699	
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													
	427.4702	260.9169	144.8015	27.5986	2.2694	0.0000	0.0000	0.0000	0.0000	38.5981	231.6217	446.1935	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1579.4699	
Space heating per m2											(98c) / (4) =	12.7686	(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 Heat pump-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	1.1000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	427.4702	260.9169	144.8015	27.5986	2.2694	0.0000	0.0000	0.0000	0.0000	38.5981	231.6217	446.1935	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.10													
307a	470.2172	287.0086	159.2816	30.3585	2.4963	0.0000	0.0000	0.0000	0.0000	42.4579	254.7839	490.8128	
Space heating requirement													
	470.2172	287.0086	159.2816	30.3585	2.4963	0.0000	0.0000	0.0000	0.0000	42.4579	254.7839	490.8128	(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

	256.8462	227.1980	241.9408	214.5768	209.1405	189.7226	188.3882	195.3127	196.7872	217.8523	229.6132	254.3331	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.10													
310a	282.5308	249.9178	266.1349	236.0345	230.0545	208.6949	207.2270	214.8440	216.4659	239.6375	252.5746	279.7664	
Water heating fuel													
	282.5308	249.9178	266.1349	236.0345	230.0545	208.6949	207.2270	214.8440	216.4659	239.6375	252.5746	279.7664	(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	33.1787	29.9679	33.1787	32.1084	33.1787	32.1084	33.1787	33.1787	32.1084	33.1787	32.1084	33.1787	(331)
Lighting	27.2245	21.8405	19.6649	14.4074	11.1287	9.0922	10.1519	13.1959	17.1401	22.4888	25.4010	27.9811	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-26.0461	-41.8579	-69.2042	-87.3847	-100.9413	-96.6488	-95.0072	-85.8801	-70.3875	-51.3888	-30.0738	-21.7541	(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												1737.4168	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2883.8827	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.3742	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9500)

mechanical ventilation fans (SFP = 0.9500)	390.6525	(330a)
Total electricity for the above, kWh/year	390.6525	(331)
Electricity for lighting (calculated in Appendix L)	219.7170	(332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-776.5747	(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	4455.0944	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			310.0000	(367)
Space and Water heating from Heat pump	1490.7418	0.1588	88.9861	(367)
Electrical energy for heat distribution (space & water)	17.3742	0.0000	6.8158	(372)
Overall CO2 factor for heat network			0.0491	(386)
Total CO2 associated with community systems			226.6814	(373)
Space and water heating			226.6814	(376)
Pumps, fans and electric keep-hot	390.6525	0.1387	54.1883	(378)
Energy for lighting	219.7170	0.1443	31.7120	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-776.5747	0.1323	-102.7768	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-102.7768	(380)
Total CO2, kg/year			209.8049	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			310.0000	(467a)
Space and Water heating from Heat pump	1490.7418	1.5877	889.8324	(467)
Electrical energy for heat distribution (space & water)	17.3742	0.0000	71.4256	(472)
Overall CO2 factor for heat network			0.5140	(486)
Total CO2 associated with community systems			2375.4777	(473)
Space and water heating			2375.4777	(476)
Pumps, fans and electric keep-hot	390.6525	1.5128	590.9792	(478)
Energy for lighting	219.7170	1.5338	337.0093	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-776.5747	1.4890	-1156.3247
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1156.3247 (480)
Total Primary energy kWh/year			2147.1415 (483)
Dwelling Primary energy Rate (DPER)			17.3600 (484)

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		61.9000 (1b)	x	2.5000 (2b)	=	154.7500 (1b)	-
First floor		61.8000 (1c)	x	2.9500 (2c)	=	182.3100 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	123.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		337.0600	(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) =	0.1187	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.3687	(18)
Number of sides sheltered			1	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3410	(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													
	0.4348	0.4263	0.4178	0.3751	0.3666	0.3240	0.3240	0.3154	0.3410	0.3666	0.3837	0.4007	(22b)
Effective ac	0.5945	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5581	0.5672	0.5736	0.5803	(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)			23.5000	1.1450	26.9084			(27)
External Wall 1	127.4340	23.5000	103.9340	0.1800	18.7081			(29a)
External Roof 1	8.0000		8.0000	0.1100	0.8800			(30)
Total net area of external elements Aum(A, m2)			135.4340					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4965			(33)
Party Wall 1			67.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 320.6797 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1500	0.0500	0.8575
E3 Sill	15.5700	0.0500	0.7785
E4 Jamb	33.5200	0.0500	1.6760
E6 Intermediate floor within a dwelling	23.5000	0.0000	0.0000
E16 Corner (normal)	16.2000	0.0900	1.4580
E18 Party wall between dwellings	10.8000	0.0600	0.6480
E7 Party floor between dwellings (in blocks of flats)	36.1000	0.0700	2.5270
E24 Eaves (insulation at ceiling level - inverted)	4.1000	0.2400	0.9840
E14 Flat roof	8.1000	0.0800	0.6480

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.5770	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	56.0735	(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	66.1291	65.7209	65.3207	63.4410	63.0893	61.4521	61.4521	61.1489	62.0827	63.0893	63.8007	64.5445	(38)
Heat transfer coeff	122.2027	121.7944	121.3942	119.5145	119.1628	117.5256	117.5256	117.2224	118.1562	119.1628	119.8743	120.6180	(39)
Average = Sum(39)m / 12 =												119.5128	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9879	0.9846	0.9814	0.9662	0.9633	0.9501	0.9501	0.9476	0.9552	0.9633	0.9691	0.9751	(40)
HLP (average)												0.9662	
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												2.8765	(42)
Hot water usage for mixer showers	72.4501	71.3613	69.7747	66.7391	64.4989	62.0006	60.5806	62.1552	63.8812	66.5636	69.6644	72.1725	(42a)
Hot water usage for baths	31.2791	30.8146	30.1604	28.9542	28.0511	27.0496	26.5087	27.1583	27.8655	28.9372	30.1682	31.1734	(42b)
Hot water usage for other uses	44.0887	42.4855	40.8823	39.2790	37.6758	36.0726	36.0726	37.6758	39.2790	40.8823	42.4855	44.0887	(42c)
Average daily hot water use (litres/day)												135.8778	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.8179	144.6613	140.8174	134.9724	130.2258	125.1228	123.1619	126.9892	131.0258	136.3830	142.3180	147.4346	(44)
Energy conte	234.1074	205.9958	216.4311	184.7704	175.3089	153.8531	148.9536	157.2392	161.5679	185.0704	202.7581	230.8469	(45)
Energy content (annual)										Total = Sum(45)m =		2256.9027	
Distribution loss (46)m = 0.15 x (45)m	35.1161	30.8994	32.4647	27.7156	26.2963	23.0780	22.3430	23.5859	24.2352	27.7606	30.4137	34.6270	(46)
Water storage loss:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8381	(55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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	283.3501	250.4731	265.6737	232.4246	224.5516	201.5073	198.1963	206.4819	209.2221	234.3131	250.4123	280.0895	(62)
WWHRS	-33.1211	-29.2926	-30.6735	-25.3989	-23.6709	-20.2553	-18.9861	-20.1899	-20.9569	-24.7059	-27.9888	-32.5078	(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	250.2289	221.1805	235.0002	207.0257	200.8807	181.2520	179.2101	186.2920	188.2651	209.6071	222.4235	247.5818	(64)
										Total per year (kWh/year) = Sum(64)m =		2528.9476	(64)
12Total per year (kWh/year)												2529	(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	117.2348	104.0754	111.3575	99.5595	97.6843	89.2795	88.9212	91.6762	91.8447	100.9300	105.5404	116.1507	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	143.8273	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.1891	164.0665	148.1891	153.1287	148.1891	153.1287	148.1891	148.1891	153.1287	148.1891	153.1287	148.1891	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	289.9549	292.9638	285.3816	269.2401	248.8644	229.7141	216.9205	213.9117	221.4939	237.6353	258.0111	277.1614	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	37.3827	(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)	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	-115.0619	(71)
Water heating gains (Table 5)	157.5737	154.8741	149.6740	138.2771	131.2962	123.9993	119.5177	123.2207	127.5620	135.6587	146.5839	156.1166	(72)
Total internal gains	664.8660	681.0526	652.3929	629.7942	597.4979	572.9904	550.7756	551.4697	568.3328	590.6313	626.8719	650.6152	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

	W/m2	or Table 6b	or Table 6c	Table 6d		
North	4.3000	10.6334	0.6300	0.7000	0.7700	13.9737 (74)
Southeast	5.7500	36.7938	0.6300	0.7000	0.7700	64.6569 (77)
South	6.3000	46.7521	0.6300	0.7000	0.7700	90.0146 (78)
West	7.1500	19.6403	0.6300	0.7000	0.7700	42.9166 (80)

Solar gains	211.5618	368.2138	522.1165	673.4866	775.6121	778.5523	747.1087	670.1397	574.6938	412.1360	254.8924	180.0554 (83)
Total gains	876.4278	1049.2664	1174.5095	1303.2808	1373.1100	1351.5427	1297.8842	1221.6094	1143.0267	1002.7673	881.7643	830.6707 (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	90.1692	90.4714	90.7697	92.1973	92.4694	93.7575	93.7575	94.0000	93.2571	92.4694	91.9206	91.3537	
alpha	7.0113	7.0314	7.0513	7.1465	7.1646	7.2505	7.2505	7.2667	7.2171	7.1646	7.1280	7.0902	
util living area													
	0.9985	0.9942	0.9800	0.9178	0.7665	0.5530	0.3981	0.4408	0.6942	0.9491	0.9949	0.9989	(86)
MIT	20.1539	20.3336	20.5574	20.8180	20.9594	20.9965	20.9997	20.9994	20.9841	20.7905	20.4257	20.1298	(87)
Th 2	20.0934	20.0962	20.0989	20.1116	20.1140	20.1251	20.1251	20.1272	20.1208	20.1140	20.1092	20.1041	(88)
util rest of house													
	0.9978	0.9919	0.9720	0.8891	0.7078	0.4792	0.3192	0.3575	0.6146	0.9243	0.9925	0.9985	(89)
MIT 2	19.1104	19.3414	19.6242	19.9423	20.0852	20.1236	20.1251	20.1270	20.1125	19.9206	19.4700	19.0880	(90)
Living area fraction									fLA = Living area / (4) =			0.2211	(91)
MIT	19.3412	19.5608	19.8306	20.1359	20.2785	20.3166	20.3185	20.3199	20.3052	20.1129	19.6813	19.3184	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3412	19.5608	19.8306	20.1359	20.2785	20.3166	20.3185	20.3199	20.3052	20.1129	19.6813	19.3184	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9971	0.9900	0.9690	0.8900	0.7192	0.4955	0.3366	0.3760	0.6319	0.9242	0.9908	0.9979	(94)
Useful gains	873.8729	1038.8253	1138.1448	1159.8655	987.5866	669.7108	436.9051	459.2685	722.2318	926.7745	873.6772	828.9531	(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													
	1838.0693	1785.5999	1618.2514	1342.8500	1022.2387	671.8446	437.0134	459.5039	733.1824	1133.5869	1508.1742	1823.5472	(97)
Space heating kWh													
	717.3621	501.8325	357.1993	131.7488	25.7811	0.0000	0.0000	0.0000	0.0000	153.8684	456.8378	739.9780	(98a)
Space heating requirement - total per year (kWh/year)												3084.6082	
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													
	717.3621	501.8325	357.1993	131.7488	25.7811	0.0000	0.0000	0.0000	0.0000	153.8684	456.8378	739.9780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3084.6082	
Space heating per m2											(98c) / (4) =	24.9362	(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													
	717.3621	501.8325	357.1993	131.7488	25.7811	0.0000	0.0000	0.0000	0.0000	153.8684	456.8378	739.9780	(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)													
	777.2071	543.6972	386.9982	142.7398	27.9319	0.0000	0.0000	0.0000	0.0000	166.7047	494.9488	801.7097	(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													
	250.2289	221.1805	235.0002	207.0257	200.8807	181.2520	179.2101	186.2920	188.2651	209.6071	222.4235	247.5818	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2834	85.8384	84.9960	83.0744	80.7307	79.8000	79.8000	79.8000	79.8000	83.3773	85.6374	86.3583	(217)
Fuel for water heating, kWh/month													
	290.0082	257.6707	276.4838	249.2052	248.8283	227.1328	224.5741	233.4486	235.9212	251.3960	259.7271	286.6915	(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	30.7908	24.7015	22.2410	16.2947	12.5865	10.2833	11.4818	14.9245	19.3854	25.4347	28.7285	31.6465	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-22.7675	-34.1021	-52.0309	-62.1943	-70.3078	-66.7813	-65.9338	-60.6102	-51.8368	-40.5555	-25.7209	-19.4549	(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	-7.4194	-16.0179	-32.6292	-50.2083	-67.6041	-68.4090	-67.6393	-56.7353	-40.8678	-23.3288	-10.0357	-5.8393	(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	3341.9374	(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	3041.0874	(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)	248.4991	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1019.0304	(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	5698.4935	(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	3341.9374	0.2100	701.8068	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3041.0874	0.2100	638.6283	(264)
Space and water heating			1340.4352	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	248.4991	0.1443	35.8661	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-572.2961	0.1334	-76.3180	
PV Unit electricity exported	-446.7343	0.1252	-55.9223	
Total			-132.2403	(269)
Total CO2, kg/year			1255.9903	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1500	(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	3341.9374	1.1300	3776.3892	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3041.0874	1.1300	3436.4287	(278)
Space and water heating			7212.8180	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	248.4991	1.5338	381.1562	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-572.2961	1.4928	-854.3143	
PV Unit electricity exported	-446.7343	0.4595	-205.2573	
Total			-1059.5715	(283)
Total Primary energy kWh/year			6664.5035	(286)
Target Primary Energy Rate (TPER)			53.8800	(287)

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Property Reference	L07-9.03 MA x3_Copy	Issued on Date	12/09/2023
Assessment Reference	L07-9.03 MA x3_Copy	Prop Type Ref	
Property			

SAP Rating	87 B	DER	2.53	TER	12.80
Environmental	98 A	% DER < TER			80.23
CO_2 Emissions (t/year)	0.16	DFEE	29.07	TFEE	29.40
Compliance Check	See BREL	% DFEE < TFEE			1.13
% DPER < TPER	61.33	DPER	26.88	TPER	69.50

Assessor Details	Mr. Richard Denteh	Assessor ID	U148-0001
Client			

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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        Storey height         Volume
                                                                                            (m2)             (m)                (m3)
Ground floor                                                                             72.2000 (1b)    x     2.7400 (2b)    =    197.8280 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)            72.2000                                                          (4)
Dwelling volume                                                                      (3a)+(3b)+(3c)+(3d)+(3e)...(3n) =    197.8280 (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                                                         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) =                72.8000 (23c)

Effective ac    0.2986    0.2954    0.2922    0.2762    0.2731    0.2571    0.2571    0.2539    0.2635    0.2731    0.2794    0.2858 (25)



-----------------------------------------------------------------------------------------------
3. Heat losses and heat loss parameter
-----------------------------------------------------------------------------------------------
Element                                         Gross      Openings      NetArea      U-value        A x U       K-value        A x K
                                                   m2            m2           m2        W/m2K          W/K        kJ/m2K         kJ/K
window (Uw = 1.30)                                                       15.4300       1.2357      19.0675                              (27)
External Wall 1                               56.1426       15.4300      40.7126       0.1400       5.6998      190.0000    7735.3940 (29a)
Total net area of external elements Aum(A, m2)                           56.1426                                                    (31)
```


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Fabric heat loss, W/K = Sum (A x U)                                  (26)...(30) + (32) =      24.7673                                  (33)
Party Wall 1                                                    56.0900           0.0000          0.0000        180.0000     10096.2000 (32)
Party Floor 1                                                   72.2000                                          40.0000      2888.0000 (32d)
Party Ceiling 1                                                 72.2000                                          30.0000      2166.0000 (32b)
Internal Wall 1                                                 80.8300                                          75.0000      6062.2500 (32c)

Heat capacity Cm = Sum(A x k)                                              (28)...(30) + (32) + (32a)...(32e) =  28947.8440 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                                                                 400.9397 (35)
List of Thermal Bridges
        K1 Element                                                              Length       Psi-value          Total
        E2 Other lintels (including other steel lintels)                        9.4800          0.0300         0.2844
        E3 Sill                                                                 7.9000          0.0300         0.2370
        E4 Jamb                                                                17.0400          0.0300         0.5112
        E7 Party floor between dwellings (in blocks of flats)                  40.9800          0.0700         2.8686
        E18 Party wall between dwellings                                        5.4800          0.0600         0.3288
        E16 Corner (normal)                                                     5.4800          0.0900         0.4932
        E8 Balcony within a dwelling, wall insulation continuous                5.8400          0.0000         0.0000
        E17 Corner (inverted - internal area greater than external area)        2.7400         -0.0900        -0.2466
Thermal bridges (Sum(L x Psi) calculated using Appendix K)                                                          4.4766 (36)
Point Thermal bridges                                                                               (36a) =        0.0000
Total fabric heat loss                                                                    (33) + (36) + (36a) =       29.2439 (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          19.4911   19.2830   19.0749   18.0345   17.8264   16.7860   16.7860   16.5779   17.2021   17.8264   18.2426   18.6588 (38)
Heat transfer coeff
               48.7350   48.5269   48.3188   47.2783   47.0703   46.0298   46.0298   45.8217   46.4460   47.0703   47.4864   47.9026 (39)
Average = Sum(39)m / 12 =                                                                                                   47.2263

                 Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
HLP             0.6750    0.6721    0.6692    0.6548    0.6519    0.6375    0.6375    0.6346    0.6433    0.6519    0.6577    0.6635 (40)
HLP (average)                                                                                                                0.6541
Days in mont        31        28        31        30        31        30        31        31        30        31        30        31



-----------------------------------------------------------------------------------------------
4. Water heating energy requirements (kWh/year)
-----------------------------------------------------------------------------------------------
Assumed occupancy                                                                                                           2.2983 (42)
Hot water usage for mixer showers
               86.2882   84.9915   83.1019   79.4865   76.8184   73.8429   72.1517   74.0270   76.0827   79.2774   82.9705   85.9576 (42a)
Hot water usage for baths
               27.1100   26.7073   26.1404   25.0950   24.3122   23.4442   22.9754   23.5384   24.1514   25.0802   26.1471   27.0183 (42b)
Hot water usage for other uses
               38.1672   36.7793   35.3914   34.0035   32.6156   31.2277   31.2277   32.6156   34.0035   35.3914   36.7793   38.1672 (42c)
Average daily hot water use (litres/day)                                                                                  139.3875 (43)

                 Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Daily hot water use
              151.5654  148.4781  144.6336  138.5849  133.7461  128.5148  126.3547  130.1810  134.2376  139.7489  145.8968  151.1431 (44)
Energy conte  240.0425  211.4309  222.2965  189.7158  180.0480  158.0240  152.8151  161.1912  165.5283  189.6380  207.8568  236.6536 (45)
Energy content (annual)                                                                                  Total = Sum(45)m =   2315.2407
Distribution loss  (46)m = 0.15 x (45)m
               36.0064   31.7146   33.3445   28.4574   27.0072   23.7036   22.9223   24.1787   24.8292   28.4457   31.1785   35.4980 (46)
Water storage loss:
Store volume                                                                                                              180.0000 (47)
a) If  manufacturer declared loss factor is known  (kWh/day):                                                              1.5200 (48)
  Temperature factor from Table 2b                                                                                          0.6000 (49)
Enter (49) or (54) in (55)                                                                                                  0.9120 (55)
Total storage loss
               28.2720   25.5360   28.2720   27.3600   28.2720   27.3600   28.2720   28.2720   27.3600   28.2720   27.3600   28.2720 (56)
If cylinder contains dedicated solar storage
               28.2720   25.5360   28.2720   27.3600   28.2720   27.3600   28.2720   28.2720   27.3600   28.2720   27.3600   28.2720 (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
              291.5769  257.9781  273.8309  239.5878  231.5824  207.8960  204.3495  212.7256  215.4003  241.1724  257.7288  288.1880 (62)
WWHRS         -65.4547  -57.8887  -60.6177  -50.1938  -46.7788  -40.0290  -37.5208  -39.8996  -41.4155  -48.8244  -55.3121  -64.2426 (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
              226.1222  200.0894  213.2132  189.3940  184.8036  167.8670  166.8287  172.8260  173.9848  192.3480  202.4167  223.9454 (64)
                                                                            Total per year (kWh/year) = Sum(64)m =   2313.8391 (64)
12Total per year (kWh/year)                                                                                                   2314 (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
              121.0417  107.5385  115.1411  102.9781  101.0935   92.4406   92.0385   94.8236   94.9358  104.2822  109.0100  119.9148 (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         114.9164  114.9164  114.9164  114.9164  114.9164  114.9164  114.9164  114.9164  114.9164  114.9164  114.9164  114.9164 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
              102.0756  113.0123  102.0756  105.4781  102.0756  105.4781  102.0756  102.0756  105.4781  102.0756  105.4781  102.0756 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
              202.3763  204.4763  199.1843  187.9182  173.6968  160.3307  151.4014  149.3013  154.5933  165.8594  180.0808  193.4469 (68)
```

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	(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)													
	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	(71)
Water heating gains (Table 5)													
	162.6904	160.0276	154.7596	143.0252	135.8783	128.3897	123.7077	127.4511	131.8552	140.1642	151.4028	161.1759	(72)
Total internal gains													
	524.6172	534.9911	513.4944	493.8964	469.1257	451.6735	434.6596	436.3029	449.4016	465.5741	494.4366	514.1733	(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	9.8500	10.6334	0.3300	0.8000	0.7700	19.1622	(74)
East	5.8200	19.6403	0.3300	0.8000	0.7700	20.0502	(76)

Solar gains	39.2124	75.8424	126.8200	194.1574	250.0967	262.3267	247.0917	203.4184	149.9413	90.1320	48.6393	32.4629	(83)
Total gains	563.8296	610.8334	640.3144	688.0538	719.2224	714.0002	681.7513	639.7213	599.3429	555.7061	543.0759	546.6361	(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	164.9958	165.7033	166.4170	170.0793	170.8312	174.6926	174.6926	175.4860	173.1273	170.8312	169.3340	167.8628	
alpha	11.9997	12.0469	12.0945	12.3386	12.3887	12.6462	12.6462	12.6991	12.5418	12.3887	12.2889	12.1909	
util living area													
	0.9962	0.9883	0.9581	0.8157	0.6081	0.4126	0.2971	0.3295	0.5346	0.8542	0.9826	0.9971	(86)
MIT	20.7308	20.8103	20.9069	20.9884	20.9996	21.0000	21.0000	21.0000	20.9999	20.9841	20.8647	20.7223	(87)
Th 2	20.3630	20.3655	20.3681	20.3809	20.3835	20.3963	20.3963	20.3989	20.3912	20.3835	20.3783	20.3732	(88)
util rest of house													
	0.9945	0.9833	0.9428	0.7796	0.5681	0.3737	0.2563	0.2864	0.4875	0.8136	0.9743	0.9958	(89)
MIT 2	20.0587	20.1601	20.2771	20.3721	20.3833	20.3963	20.3963	20.3989	20.3912	20.3720	20.2391	20.0571	(90)
Living area fraction									fLA = Living area / (4) =			0.3940	(91)
MIT	20.3235	20.4163	20.5253	20.6150	20.6261	20.6342	20.6342	20.6358	20.6310	20.6132	20.4856	20.3192	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3235	20.4163	20.5253	20.6150	20.6261	20.6342	20.6342	20.6358	20.6310	20.6132	20.4856	20.3192	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9838	0.9470	0.7935	0.5839	0.3890	0.2724	0.3034	0.5061	0.8293	0.9760	0.9956	(94)
Useful gains	560.6371	600.9094	606.3942	545.9990	419.9310	277.7523	185.6938	194.0902	303.3117	460.8680	530.0319	544.2425	(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													
	780.9065	752.9600	677.6843	553.8640	420.1551	277.7534	185.6938	194.0902	303.3410	471.3233	635.6357	772.1531	(97)
Space heating kWh													
	163.8804	102.1780	53.0398	5.6628	0.1667	0.0000	0.0000	0.0000	0.0000	7.7787	76.0347	169.5655	(98a)
Space heating requirement - total per year (kWh/year)												578.3069	
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													
	163.8804	102.1780	53.0398	5.6628	0.1667	0.0000	0.0000	0.0000	0.0000	7.7787	76.0347	169.5655	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												578.3069	
Space heating per m2											(98c) / (4) =	8.0098	(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 Heat pump-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	1.1000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:													
Space heating requirement													
	163.8804	102.1780	53.0398	5.6628	0.1667	0.0000	0.0000	0.0000	0.0000	7.7787	76.0347	169.5655	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.10													
307a	180.2685	112.3958	58.3438	6.2291	0.1834	0.0000	0.0000	0.0000	0.0000	8.5566	83.6382	186.5221	
Space heating requirement													
	180.2685	112.3958	58.3438	6.2291	0.1834	0.0000	0.0000	0.0000	0.0000	8.5566	83.6382	186.5221	(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													
	226.1222	200.0894	213.2132	189.3940	184.8036	167.8670	166.8287	172.8260	173.9848	192.3480	202.4167	223.9454	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.10													
310a	248.7344	220.0983	234.5346	208.3334	203.2839	184.6537	183.5116	190.1086	191.3833	211.5828	222.6584	246.3400	
Water heating fuel													
	248.7344	220.0983	234.5346	208.3334	203.2839	184.6537	183.5116	190.1086	191.3833	211.5828	222.6584	246.3400	(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	12.8114	11.5716	12.8114	12.3981	12.8114	12.3981	12.8114	12.8114	12.3981	12.8114	12.3981	12.8114	(331)
Lighting	18.7528	15.0442	13.5456	9.9241	7.6656	6.2629	6.9929	9.0896	11.8065	15.4907	17.4967	19.2739	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-3.1381	-5.0274	-8.2217	-10.5650	-12.6329	-12.2688	-12.1089	-10.7766	-8.7127	-6.2565	-3.6543	-2.6467	(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												636.1375	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2545.2230	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3614	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6250)													
mechanical ventilation fans (SFP = 0.6250)												150.8439	(330a)
Total electricity for the above, kWh/year												150.8439	(331)
Electricity for lighting (calculated in Appendix L)												151.3454	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-96.0095	(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												3387.5403	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			310.0000	(367)
Space and Water heating from Heat pump	1026.2453	0.1594	32.7112	(367)
Electrical energy for heat distribution (space & water)	6.3614	0.0000	4.5939	(372)
Overall CO2 factor for heat network			0.0480	(386)
Total CO2 associated with community systems			152.7850	(373)
Space and water heating			152.7850	(376)
Pumps, fans and electric keep-hot	150.8439	0.1387	20.9239	(378)
Energy for lighting	151.3454	0.1443	21.8438	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-96.0095	0.1320	-12.6725	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-12.6725	(380)
Total CO2, kg/year			182.8803	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			310.0000	(467a)
Space and Water heating from Heat pump	1026.2453	1.5900	326.2845	(467)
Electrical energy for heat distribution (space & water)	6.3614	0.0000	48.8038	(472)
Overall CO2 factor for heat network			0.5102	(486)
Total CO2 associated with community systems			1623.1204	(473)
Space and water heating			1623.1204	(476)
Pumps, fans and electric keep-hot	150.8439	1.5128	228.1966	(478)
Energy for lighting	151.3454	1.5338	232.1387	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-96.0095	1.4877	-142.8304	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-142.8304	(480)
Total Primary energy kWh/year			1940.6252	(483)
Dwelling Primary energy Rate (DPER)			26.8800	(484)

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	72.2000 (1b)	x 2.7400 (2b) =	197.8280 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.2000				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	197.8280 (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	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1516	(8)

Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4016 (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) = 0.3414 (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													
	0.4353	0.4267	0.4182	0.3755	0.3670	0.3243	0.3243	0.3158	0.3414	0.3670	0.3841	0.4011	(22b)
Effective ac	0.5947	0.5911	0.5875	0.5705	0.5673	0.5526	0.5526	0.5499	0.5583	0.5673	0.5738	0.5805	(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)			15.4300	1.1450	17.6679			(27)
External Wall 1	56.1426	15.4300	40.7126	0.1800	7.3283			(29a)
Total net area of external elements Aum(A, m2)			56.1426					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.9962			(33)
Party Wall 1			56.0900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	410.9397 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.4800	0.0500	0.4740
E3 Sill	7.9000	0.0500	0.3950
E4 Jamb	17.0400	0.0500	0.8520
E7 Party floor between dwellings (in blocks of flats)	40.9800	0.0700	2.8686
E18 Party wall between dwellings	5.4800	0.0600	0.3288
E16 Corner (normal)	5.4800	0.0900	0.4932
E8 Balcony within a dwelling, wall insulation continuous	5.8400	0.0000	0.0000
E17 Corner (inverted – internal area greater than external area)	2.7400	-0.0900	-0.2466

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.1650 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.1612 (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	38.8263	38.5862	38.3508	37.2451	37.0382	36.0752	36.0752	35.8969	36.4461	37.0382	37.4567	37.8942	(38)
Heat transfer coeff													
	68.9875	68.7474	68.5120	67.4063	67.1994	66.2364	66.2364	66.0581	66.6073	67.1994	67.6179	68.0554	(39)
Average = Sum(39)m / 12 =												67.4053	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9555	0.9522	0.9489	0.9336	0.9307	0.9174	0.9174	0.9149	0.9225	0.9307	0.9365	0.9426	(40)
HLP (average)												0.9336	
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	2.2983	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	62.7551	61.8120	60.4377	57.8083	55.8679	53.7039	52.4739	53.8378	55.3329	57.6563	60.3422	62.5146	(42a)
Hot water usage for baths													
	27.1100	26.7073	26.1404	25.0950	24.3122	23.4442	22.9754	23.5384	24.1514	25.0802	26.1471	27.0183	(42b)
Hot water usage for other uses													
	38.1672	36.7793	35.3914	34.0035	32.6156	31.2277	31.2277	32.6156	34.0035	35.3914	36.7793	38.1672	(42c)
Average daily hot water use (litres/day)												117.6907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.0322	125.2986	121.9695	116.9068	112.7957	108.3758	106.6770	109.9918	113.4877	118.1278	123.2685	127.7001	(44)
Energy conte	202.7718	178.4236	187.4626	160.0395	151.8447	133.2607	129.0166	136.1928	139.9417	160.2984	175.6186	199.9476	(45)
Energy content (annual)										Total = Sum(45)m =		1954.8185	
Distribution loss (46)m = 0.15 x (45)m													
	30.4158	26.7635	28.1194	24.0059	22.7767	19.9891	19.3525	20.4289	20.9913	24.0448	26.3428	29.9921	(46)
Water storage loss:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8381	(55)
Total storage loss													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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													
	252.0144	222.9008	236.7052	207.6937	201.0873	180.9149	178.2593	185.4355	187.5959	209.5410	223.2728	249.1902	(62)
WWHRS	-28.6890	-25.3728	-26.5689	-22.0001	-20.5033	-17.5448	-16.4455	-17.4881	-18.1526	-21.3999	-24.2435	-28.1577	(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													
	223.3254	197.5280	210.1363	185.6936	180.5840	163.3701	161.8138	167.9473	169.4434	188.1412	199.0294	221.0325	(64)
									Total per year (kWh/year) = Sum(64)m =			2268.0450	(64)
12Total per year (kWh/year)												2268	(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													
	106.8157	94.9076	101.7254	91.3365	89.8825	82.4326	82.2922	84.6782	84.6540	92.6933	96.5166	105.8767	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	114.9164	114.9164	114.9164	114.9164	114.9164	114.9164	114.9164	114.9164	114.9164	114.9164	114.9164	114.9164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.2420	113.1965	102.2420	105.6501	102.2420	105.6501	102.2420	102.2420	105.6501	102.2420	105.6501	102.2420	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	202.3763	204.4763	199.1843	187.9182	173.6968	160.3307	151.4014	149.3013	154.5933	165.8594	180.0808	193.4469	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	34.4916	(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)													
	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	-91.9332	(71)
Water heating gains (Table 5)													
	143.5695	141.2316	136.7277	126.8563	120.8098	114.4897	110.6077	113.8148	117.5750	124.5878	134.0508	142.3074	(72)
Total internal gains													
	508.6628	519.3794	498.6290	480.8995	457.2236	437.9454	421.7260	422.8331	435.2933	453.1642	480.2566	498.4712	(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	9.8500	10.6334	0.6300	0.7000	0.7700	32.0096	(74)
East	5.5800	19.6403	0.6300	0.7000	0.7700	33.4929	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	65.5025	126.6912	211.8470	324.3312	417.7752	438.2049	412.7555	339.8012	250.4701	150.5614	81.2497	54.2277	(83)
Total gains	574.1653	646.0706	710.4760	805.2307	874.9987	876.1503	834.4815	762.6343	685.7635	603.7255	561.5063	552.6990	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	119.4654	119.8827	120.2947	122.2679	122.6443	124.4274	124.4274	124.7633	123.7345	122.6443	121.8852	121.1016	
alpha	8.9644	8.9922	9.0196	9.1512	9.1763	9.2952	9.2952	9.3176	9.2490	9.1763	9.1257	9.0734	
util living area													
	0.9990	0.9967	0.9857	0.9072	0.7046	0.4835	0.3492	0.3984	0.6646	0.9541	0.9963	0.9993	(86)
MIT	20.4171	20.5334	20.7044	20.9140	20.9915	20.9997	21.0000	21.0000	20.9962	20.8758	20.6158	20.4035	(87)
Th 2	20.1206	20.1234	20.1261	20.1390	20.1414	20.1527	20.1527	20.1548	20.1484	20.1414	20.1366	20.1314	(88)
util rest of house													
	0.9985	0.9950	0.9782	0.8718	0.6440	0.4197	0.2820	0.3252	0.5857	0.9266	0.9940	0.9989	(89)
MIT 2	19.4507	19.6011	19.8174	20.0670	20.1365	20.1526	20.1527	20.1548	20.1468	20.0354	19.7175	19.4423	(90)
Living area fraction									fLA = Living area / (4) =			0.3940	(91)
MIT	19.8315	19.9685	20.1669	20.4007	20.4734	20.4864	20.4866	20.4878	20.4815	20.3666	20.0714	19.8211	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8315	19.9685	20.1669	20.4007	20.4734	20.4864	20.4866	20.4878	20.4815	20.3666	20.0714	19.8211	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9983	0.9946	0.9787	0.8835	0.6678	0.4449	0.3085	0.3541	0.6170	0.9350	0.9938	0.9987	(94)
Useful gains	573.1706	642.5555	695.3108	711.4282	584.3402	389.7799	257.4305	270.0241	423.1020	564.4624	558.0180	551.9962	(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													
	1071.4788	1035.9178	936.3486	775.2219	589.5694	389.8965	257.4336	270.0351	425.0536	656.3071	877.1015	1063.0992	(97)
Space heating kWh													
	370.7413	264.3395	179.3321	45.9314	3.8905	0.0000	0.0000	0.0000	0.0000	68.3325	229.7401	380.2606	(98a)
Space heating requirement - total per year (kWh/year)												1542.5681	
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													
	370.7413	264.3395	179.3321	45.9314	3.8905	0.0000	0.0000	0.0000	0.0000	68.3325	229.7401	380.2606	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1542.5681	
Space heating per m2											(98c) / (4) =	21.3652	(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													
	370.7413	264.3395	179.3321	45.9314	3.8905	0.0000	0.0000	0.0000	0.0000	68.3325	229.7401	380.2606	(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)													
	401.6699	286.3917	194.2927	49.7632	4.2150	0.0000	0.0000	0.0000	0.0000	74.0330	248.9059	411.9834	(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													
	223.3254	197.5280	210.1363	185.6936	180.5840	163.3701	161.8138	167.9473	169.4434	188.1412	199.0294	221.0325	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1882	84.7139	83.7064	81.4367	79.9709	79.8000	79.8000	79.8000	79.8000	82.0147	84.3824	85.2651	(217)
Fuel for water heating, kWh/month													
	262.1553	233.1707	251.0398	228.0220	225.8121	204.7244	202.7742	210.4603	212.3350	229.3994	235.8659	259.2298	(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	21.2439	17.0426	15.3450	11.2424	8.6840	7.0949	7.9218	10.2970	13.3748	17.5485	19.8210	21.8343	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.9741	-12.3677	-19.5340	-24.2038	-28.1474	-27.0385	-26.7111	-24.1766	-20.1180	-15.0681	-9.1566	-6.7694	(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	-1.6363	-3.5888	-7.4189	-11.5813	-15.7591	-16.0014	-15.8140	-13.1822	-9.3959	-5.2705	-2.2271	-1.2834	(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												1671.2547	(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												2754.9890	(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)												171.4502	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-324.4242	(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												4359.2697	(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	1671.2547	0.2100	350.9635	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2754.9890	0.2100	578.5477	(264)
Space and water heating			929.5112	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	171.4502	0.1443	24.7456	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-221.2652	0.1327	-29.3509	
PV Unit electricity exported	-103.1590	0.1248	-12.8728	
Total			-42.2238	(269)
Total CO2, kg/year			923.9622	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8000	(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	1671.2547	1.1300	1888.5178	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2754.9890	1.1300	3113.1375	(278)
Space and water heating			5001.6553	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	171.4502	1.5338	262.9761	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-221.2652	1.4901	-329.7166	
PV Unit electricity exported	-103.1590	0.4580	-47.2465	
Total			-376.9631	(283)
Total Primary energy kWh/year			5017.7691	(286)
Target Primary Energy Rate (TPER)			69.5000	(287)