Full SAP Calculation Printout

Property Reference	13, 07 x2_Copy_Copy	Issued on Date	12/09/2023
Assessment Reference	13, 07 x2_Copy_Copy	Prop Type Ref	
Property			

SAP Rating	84 B	DER	3.18	TER	9.48
Environmental	97 A	% DER < TER			66.46
CO_2 Emissions (t/year)	0.46	DFEE	30.72	TFEE	37.91
Compliance Check	See BREL	% DFEE < TFEE			18.95
% DPER < TPER	32.57	DPER	33.39	TPER	49.52

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	61.1000 (1b)	x	2.7300 (2b)	=	166.8030 (1b)	-
First floor	62.1000 (1c)	x	2.9600 (2c)	=	183.8160 (1c)	-
Second floor	39.1000 (1d)	x	3.0200 (2d)	=	118.0820 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	162.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	468.7010	(5)

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2. Ventilation rate

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		m3 per hour		
Number of open chimneys	0 * 80	=	0.0000	(6a)
Number of open flues	0 * 20	=	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10	=	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20	=	0.0000	(6d)
Number of flues attached to other heater	0 * 35	=	0.0000	(6e)
Number of blocked chimneys	0 * 20	=	0.0000	(6f)
Number of intermittent extract fans	0 * 10	=	0.0000	(7a)
Number of passive vents	0 * 10	=	0.0000	(7b)
Number of flueless gas fires	0 * 40	=	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5)	=	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)]	=	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20)	=	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		45.0000 (23c)

Effective ac	0.4376	0.4344	0.4312	0.4153	0.4121	0.3961	0.3961	0.3929	0.4025	0.4121	0.4184	0.4248	(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)			26.0900	0.7752	20.2248			(27)
front door					2.0000	1.0000	2.0000	(26)
Heatloss Floor 1					61.1000	0.0800	4.8880	110.0000	6721.0000	(28a)
exposed floor					1.6800	0.0800	0.1344			(28b)
External Wall 1	128.0622	28.0900			99.9722	0.1300	12.9964	190.0000	18994.7180	(29a)
External Roof 1	41.2700				41.2700	0.1000	4.1270	9.0000	371.4300	(30)
External Roof 2	19.2300				19.2300	0.1000	1.9230	9.0000	173.0700	(30)
Total net area of external elements Aum(A, m2)					251.3422					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		46.2936			(33)
Party Wall 1					114.0000	0.0000	0.0000	180.0000	20520.0000	(32)
Internal Wall 1					330.5300			9.0000	2974.7700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	49754.9880 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		306.5618 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	16.9600	0.0500	0.8480	
E3 Sill	15.7600	0.0500	0.7880	
E4 Jamb	40.5800	0.0500	2.0290	
E5 Ground floor (normal)	13.4000	0.1600	2.1440	
E6 Intermediate floor within a dwelling	13.4000	0.0010	0.0134	
E20 Exposed floor (normal)	1.8000	0.3200	0.5760	
E13 Gable (insulation at rafter level)	12.0000	0.0800	0.9600	
R5 Ridge (inverted)	6.5500	0.0400	0.2620	
P1 Party wall - Ground floor	20.4500	0.0800	1.6360	
P4 Party wall - Roof (insulation at ceiling level)	27.7000	0.1200	3.3240	
E14 Flat roof	9.2300	0.0800	0.7384	
P2 Party wall - Intermediate floor within a dwelling	21.0000	0.0000	0.0000	
R7 Flat ceiling (inverted)	5.6500	0.0400	0.2260	
E16 Corner (normal)	17.8800	0.0900	1.6092	
E18 Party wall between dwellings	36.6000	0.0600	2.1960	
R4 Ridge (vaulted ceiling)	6.5500	0.0800	0.5240	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				17.8740 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	64.1676 (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	67.6784	67.1854	66.6923	64.2273	63.7343	61.2692	61.2692	60.7762	62.2552	63.7343	64.7203	65.7063	(38)
Heat transfer coeff	131.8460	131.3530	130.8599	128.3949	127.9018	125.4368	125.4368	124.9438	126.4228	127.9018	128.8879	129.8739	(39)

Average = Sum(39)m / 12 = 128.2716

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8124	0.8093	0.8063	0.7911	0.7881	0.7729	0.7729	0.7698	0.7789	0.7881	0.7941	0.8002	(40)
HLP (average)												0.7903	
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		2.9521 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	101.3610	99.8377	97.6180	93.3710	90.2369	86.7417	84.7550	86.9579	89.3727	93.1255	97.4637	100.9726	(42a)
Hot water usage for baths	31.8240	31.3513	30.6858	29.4586	28.5397	27.5208	26.9704	27.6313	28.3509	29.4412	30.6937	31.7164	(42b)
Hot water usage for other uses	44.8626	43.2312	41.5998	39.9685	38.3371	36.7057	36.7057	38.3371	39.9685	41.5998	43.2312	44.8626	(42c)
Average daily hot water use (litres/day)												163.7414	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	178.0475	174.4202	169.9036	162.7981	157.1137	150.9682	148.4312	152.9264	157.6921	164.1665	171.3885	177.5516	(44)
Energy conte	281.9837	248.3721	261.1355	222.8625	211.5052	185.6331	179.5147	189.3548	194.4501	222.7724	244.1744	278.0028	(45)
Energy content (annual)											Total = Sum(45)m =	2719.7613	
Distribution loss (46)m = 0.15 x (45)m	42.2976	37.2558	39.1703	33.4294	31.7258	27.8450	26.9272	28.4032	29.1675	33.4159	36.6262	41.7004	(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		0.5400 (49)
Enter (49) or (54) in (55)		0.8208 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	25.4448	22.9824	25.4448	24.6240	25.4448	24.6240	25.4448	25.4448	24.6240	25.4448	24.6240	25.4448	(56)
If cylinder contains dedicated solar storage	25.4448	22.9824	25.4448	24.6240	25.4448	24.6240	25.4448	25.4448	24.6240	25.4448	24.6240	25.4448	(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	330.6909	292.3657	309.8427	269.9985	260.2124	232.7691	228.2219	238.0620	241.5861	271.4796	291.3104	326.7100	(62)
WWHRS	-76.8882	-68.0006	-71.2063	-58.9616	-54.9501	-47.0212	-44.0749	-46.8692	-48.6500	-57.3529	-64.9739	-75.4644	(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	253.8027	224.3651	238.6364	211.0369	205.2623	185.7479	184.1470	191.1928	192.9362	214.1267	226.3365	251.2456	(64)
											Total per year (kWh/year) = Sum(64)m =	2578.8360	(64)
12Total per year (kWh/year)												2579	(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	132.7253	117.7786	125.7933	111.8106	109.2912	99.4318	98.6544	101.9262	102.3635	113.0376	118.8968	131.4017	(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	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	175.3892	194.1809	175.3892	181.2355	175.3892	181.2355	175.3892	175.3892	181.2355	175.3892	181.2355	175.3892	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	333.6109	337.0727	328.3490	309.7772	286.3337	264.3001	249.5803	246.1185	254.8422	273.4140	296.8575	318.8911	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	(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)

	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	(71)

Water heating gains (Table 5)

	178.3943	175.2658	169.0771	155.2925	146.8968	138.0997	132.6000	136.9976	142.1715	151.9322	165.1344	176.6152	(72)
Total internal gains													
	754.6760	773.8011	740.0969	713.5869	675.9014	650.9170	624.8512	625.7870	645.5309	668.0171	710.5091	738.1771	(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	10.9200	10.6334	0.5000	0.8000	0.7700	32.1875	(74)
South	11.5200	46.7521	0.5000	0.8000	0.7700	149.2954	(78)
Southwest	3.6500	36.7938	0.5000	0.8000	0.7700	37.2273	(79)

Solar gains	218.7102	369.4313	502.7459	627.4120	713.4018	714.6767	686.2182	619.9246	544.9732	407.0298	261.2631	187.6969	(83)
Total gains	973.3863	1143.2323	1242.8428	1340.9989	1389.3032	1365.5937	1311.0694	1245.7116	1190.5041	1075.0469	971.7722	925.8740	(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, n1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	104.8256	105.2190	105.6154	107.6432	108.0581	110.1816	110.1816	110.6164	109.3223	108.0581	107.2314	106.4173	
alpha	7.9884	8.0146	8.0410	8.1762	8.2039	8.3454	8.3454	8.3744	8.2882	8.2039	8.1488	8.0945	
util living area													
	0.9992	0.9967	0.9883	0.9445	0.8109	0.5850	0.4208	0.4610	0.7170	0.9611	0.9969	0.9994	(86)
Living	20.2734	20.4232	20.6040	20.8298	20.9627	20.9976	20.9999	20.9997	20.9889	20.8238	20.5122	20.2558	
Non living	19.5749	19.7262	19.9067	20.1313	20.2417	20.2760	20.2769	20.2795	20.2667	20.1316	19.8264	19.5663	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6283	20.4232	20.6040	20.8298	20.9627	20.9976	20.9999	20.9997	20.9889	20.8238	20.5122	20.3599	(87)
Th 2	20.2426	20.2453	20.2479	20.2611	20.2637	20.2769	20.2769	20.2796	20.2716	20.2637	20.2584	20.2532	(88)
util rest of house													
	0.9989	0.9954	0.9836	0.9246	0.7617	0.5204	0.3518	0.3890	0.6484	0.9427	0.9954	0.9992	(89)
MIT 2	19.9010	19.7262	19.9067	20.1313	20.2417	20.2760	20.2769	20.2795	20.2667	20.1316	19.8264	19.6623	(90)
Living area fraction									fLA = Living area / (4) =			0.1348	(91)
MIT	19.9991	19.8201	20.0007	20.2254	20.3389	20.3733	20.3743	20.3766	20.3641	20.2249	19.9189	19.7564	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9991	19.8201	20.0007	20.2254	20.3389	20.3733	20.3743	20.3766	20.3641	20.2249	19.9189	19.7564	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9987	0.9944	0.9817	0.9235	0.7670	0.5291	0.3611	0.3987	0.6574	0.9415	0.9945	0.9990	(94)
Useful gains	972.1406	1136.8460	1220.1093	1238.4008	1065.5990	722.4712	473.3802	496.7139	782.6726	1012.1515	966.4338	924.9670	(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													
	2069.8586	1959.8050	1766.7063	1454.1275	1104.9267	724.1847	473.4417	496.8495	791.9199	1231.0434	1652.1965	2020.3674	(97)
Space heating kWh													
	816.7022	553.0285	406.6682	155.3232	29.2598	0.0000	0.0000	0.0000	0.0000	162.8556	493.7491	814.9779	(98a)
Space heating requirement - total per year (kWh/year)												3432.5645	
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													
	816.7022	553.0285	406.6682	155.3232	29.2598	0.0000	0.0000	0.0000	0.0000	162.8556	493.7491	814.9779	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3432.5645	
Space heating per m2											(98c) / (4) =	21.1495	(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 %)	248.8827	(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													
	816.7022	553.0285	406.6682	155.3232	29.2598	0.0000	0.0000	0.0000	0.0000	162.8556	493.7491	814.9779	(98)
Space heating efficiency (main heating system 1)													
	248.8827	248.8827	248.8827	248.8827	248.8827	0.0000	0.0000	0.0000	0.0000	248.8827	248.8827	248.8827	(210)
Space heating fuel (main heating system)													
	328.1475	222.2045	163.3976	62.4082	11.7565	0.0000	0.0000	0.0000	0.0000	65.4347	198.3863	327.4547	(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													
	253.8027	224.3651	238.6364	211.0369	205.2623	185.7479	184.1470	191.1928	192.9362	214.1267	226.3365	251.2456	(64)
Efficiency of water heater												177.3050	(216)
(217)m	177.3050	177.3050	177.3050	177.3050	177.3050	177.3050	177.3050	177.3050	177.3050	177.3050	177.3050	177.3050	(217)
Fuel for water heating, kWh/month													
	143.1447	126.5419	134.5909	119.0247	115.7679	104.7618	103.8589	107.8327	108.8160	120.7674	127.6537	141.7025	(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	35.2097	31.8023	35.2097	34.0739	35.2097	34.0739	35.2097	35.2097	34.0739	35.2097	34.0739	35.2097	(231)
Lighting	32.2215	25.8493	23.2744	17.0518	13.1713	10.7611	12.0153	15.6180	20.2862	26.6166	30.0634	33.1170	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1379.1900	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	177.3050	
Water heating fuel used	1454.4630	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7250)		
mechanical ventilation fans (SFP = 0.7250)	414.5660	(230a)
Total electricity for the above, kWh/year	414.5660	(231)
Electricity for lighting (calculated in Appendix L)	260.0461	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3508.2650	(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	1379.1900	0.1572	216.7474	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1454.4630	0.1408	204.7237	(264)
Space and water heating			421.4711	(265)
Pumps, fans and electric keep-hot	414.5660	0.1387	57.5054	(267)
Energy for lighting	260.0461	0.1443	37.5327	(268)
Total CO2, kg/year			516.5092	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1800	(273)

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

	Energy	Primary energy factor	Primary energy	

	kWh/year	kg CO2/kWh	kWh/year	
Space heating - main system 1	1379.1900	1.5818	2181.5749	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1454.4630	1.5205	2211.4463	(278)
Space and water heating			4393.0211	(279)
Pumps, fans and electric keep-hot	414.5660	1.5128	627.1555	(281)
Energy for lighting	260.0461	1.5338	398.8673	(282)
Total Primary energy kWh/year			5419.0440	(286)
Dwelling Primary energy Rate (DPER)			33.3900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.1000 (1b)	x	2.7300 (2b)	=	166.8030 (1b)	-
First floor	62.1000 (1c)	x	2.9600 (2c)	=	183.8160 (1c)	-
Second floor	39.1000 (1d)	x	3.0200 (2d)	=	118.0820 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	162.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	468.7010	(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) =	0.0853	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3353	(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) =	0.2850	(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													
	0.3634	0.3563	0.3492	0.3135	0.3064	0.2708	0.2708	0.2637	0.2850	0.3064	0.3207	0.3349	(22b)
Effective ac	0.5660	0.5635	0.5610	0.5492	0.5469	0.5367	0.5367	0.5348	0.5406	0.5469	0.5514	0.5561	(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 Opaque door			2.0000	1.0000	2.0000			(26)
TER Opening Type (Uw = 1.20)			26.0900	1.1450	29.8740			(27)
Heatloss Floor 1			61.1000	0.1300	7.9430			(28a)
exposed floor			1.6800	0.1300	0.2184			(28b)
External Wall 1	128.0622	28.0900	99.9722	0.1800	17.9950			(29a)
External Roof 1	41.2700		41.2700	0.1100	4.5397			(30)
External Roof 2	19.2300		19.2300	0.1100	2.1153			(30)
Total net area of external elements Aum(A, m2)			251.3422					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.6854			(33)
Party Wall 1			114.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 306.5618 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	16.9600	0.0500	0.8480
E3 Sill	15.7600	0.0500	0.7880
E4 Jamb	40.5800	0.0500	2.0290
E5 Ground floor (normal)	13.4000	0.1600	2.1440
E6 Intermediate floor within a dwelling	13.4000	0.0000	0.0000
E20 Exposed floor (normal)	1.8000	0.3200	0.5760
E13 Gable (insulation at rafter level)	12.0000	0.0800	0.9600
R5 Ridge (inverted)	6.5500	0.0400	0.2620
P1 Party wall - Ground floor	20.4500	0.0800	1.6360
P4 Party wall - Roof (insulation at ceiling level)	27.7000	0.1200	3.3240
E14 Flat roof	9.2300	0.0800	0.7384
P2 Party wall - Intermediate floor within a dwelling	21.0000	0.0000	0.0000
R7 Flat ceiling (inverted)	5.6500	0.0400	0.2260
E16 Corner (normal)	17.8800	0.0900	1.6092
E18 Party wall between dwellings	36.6000	0.0600	2.1960
R4 Ridge (vaulted ceiling)	6.5500	0.0800	0.5240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.8606 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 82.5460 (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	87.5501	87.1535	86.7647	84.9386	84.5969	83.0064	83.0064	82.7119	83.6191	84.5969	85.2881	86.0107	(38)
Heat transfer coeff	170.0961	169.6995	169.3107	167.4846	167.1430	165.5525	165.5525	165.2579	166.1651	167.1430	167.8341	168.5567	(39)
Average = Sum(39)m / 12 =												167.4830	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0480	1.0456	1.0432	1.0319	1.0298	1.0200	1.0200	1.0182	1.0238	1.0298	1.0341	1.0386	(40)
HLP (average)												1.0319	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9521 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.7171	72.6092	70.9949	67.9062	65.6268	63.0849	61.6400	63.2421	64.9983	67.7276	70.8827	73.4346	(42a)
Hot water usage for baths	31.8240	31.3513	30.6858	29.4586	28.5397	27.5208	26.9704	27.6313	28.3509	29.4412	30.6937	31.7164	(42b)
Hot water usage for other uses	44.8626	43.2312	41.5998	39.9685	38.3371	36.7057	36.7057	38.3371	39.9685	41.5998	43.2312	44.8626	(42c)
Average daily hot water use (litres/day)												138.2546	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.4036	147.1918	143.2805	137.3333	132.5036	127.3114	125.3162	129.2106	133.3177	138.7687	144.8075	150.0136	(44)
Energy conte	238.2025	209.5991	220.2168	188.0024	178.3754	156.5442	151.5591	159.9897	164.3941	188.3078	206.3049	234.8850	(45)
Energy content (annual)											Total = Sum(45)m =	2296.3810	
Distribution loss (46)m = 0.15 x (45)m	35.7304	31.4399	33.0325	28.2004	26.7563	23.4816	22.7339	23.9985	24.6591	28.2462	30.9457	35.2328	(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	287.4452	254.0764	269.4595	235.6566	227.6180	204.1984	200.8018	209.2323	212.0483	237.5504	253.9591	284.1277	(62)
WWHRS	-33.7004	-29.8049	-31.2099	-25.8431	-24.0848	-20.6095	-19.3182	-20.5429	-21.3234	-25.1380	-28.4783	-33.0763	(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	253.7448	224.2715	238.2496	209.8135	203.5332	183.5889	181.4836	188.6894	190.7249	212.4125	225.4808	251.0514	(64)
											Total per year (kWh/year) = Sum(64)m =	2563.0441	(64)
12Total per year (kWh/year)												2563	(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	118.5965	105.2735	112.6162	100.6342	98.7039	90.1743	89.7875	92.5907	92.7844	102.0065	106.7197	117.4934	(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	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	147.6056	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	175.3892	194.1809	175.3892	181.2355	175.3892	181.2355	175.3892	175.3892	181.2355	175.3892	181.2355	175.3892	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.6109	337.0727	328.3490	309.7772	286.3337	264.3001	249.5803	246.1185	254.8422	273.4140	296.8575	318.8911	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	37.7606	(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)												
	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	-118.0845	(71)
Water heating gains (Table 5)												
	159.4039	156.6570	151.3659	139.7697	132.6666	125.2421	120.6822	124.4499	128.8672	137.1055	148.2218	157.9212 (72)
Total internal gains												
	738.6856	758.1923	725.3858	701.0641	664.6712	638.0594	612.9334	613.2392	632.2266	656.1903	696.5965	722.4832 (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	10.9200	10.6334	0.6300	0.7000	0.7700	35.4868	(74)
South	11.5200	46.7521	0.6300	0.7000	0.7700	164.5982	(78)
Southwest	3.6500	36.7938	0.6300	0.7000	0.7700	41.0431	(79)

Solar gains	241.1280	407.2980	554.2773	691.7217	786.5255	787.9311	756.5555	683.4669	600.8330	448.7503	288.0426	206.9358	(83)
Total gains	979.8136	1165.4903	1279.6631	1392.7858	1451.1967	1425.9905	1369.4889	1296.7061	1233.0596	1104.9407	984.6391	929.4190	(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	81.2530	81.4430	81.6300	82.5200	82.6887	83.4831	83.4831	83.6319	83.1753	82.6887	82.3482	81.9951	
alpha	6.4169	6.4295	6.4420	6.5013	6.5126	6.5655	6.5655	6.5755	6.5450	6.5126	6.4899	6.4663	
util living area													
	0.9993	0.9976	0.9927	0.9710	0.8947	0.7126	0.5279	0.5789	0.8339	0.9803	0.9979	0.9995	(86)
MIT	19.9404	20.1062	20.3251	20.6152	20.8539	20.9752	20.9969	20.9945	20.9324	20.6260	20.2296	19.9152	(87)
Th 2	20.0435	20.0455	20.0475	20.0568	20.0585	20.0667	20.0667	20.0682	20.0635	20.0585	20.0550	20.0513	(88)
util rest of house													
	0.9990	0.9966	0.9896	0.9576	0.8499	0.6226	0.4183	0.4658	0.7569	0.9687	0.9968	0.9993	(89)
MIT 2	18.8024	19.0162	19.2964	19.6652	19.9386	20.0540	20.0659	20.0666	20.0213	19.6845	19.1818	18.7762	(90)
Living area fraction									fLA = Living area / (4) =			0.1348	(91)
MIT	18.9558	19.1631	19.4351	19.7932	20.0620	20.1782	20.1914	20.1917	20.1441	19.8114	19.3231	18.9298	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9558	19.1631	19.4351	19.7932	20.0620	20.1782	20.1914	20.1917	20.1441	19.8114	19.3231	18.9298	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9985	0.9953	0.9867	0.9529	0.8500	0.6339	0.4331	0.4811	0.7644	0.9645	0.9955	0.9989	(94)
Useful gains	978.3267	1159.9631	1262.6569	1327.1564	1233.5789	903.9785	593.1522	623.8800	942.5467	1065.7403	980.2516	928.4064	(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													
	2492.8985	2420.4458	2190.0549	1824.4510	1397.6437	923.4841	594.5601	626.6040	1004.3235	1539.6251	2051.4488	2482.7991	(97)
Space heating kWh													
	1126.8414	847.0444	689.9841	358.0521	122.0642	0.0000	0.0000	0.0000	0.0000	352.5703	771.2620	1156.4682	(98a)
Space heating requirement - total per year (kWh/year)												5424.2866	
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													
	1126.8414	847.0444	689.9841	358.0521	122.0642	0.0000	0.0000	0.0000	0.0000	352.5703	771.2620	1156.4682	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5424.2866	
Space heating per m2											(98c) / (4) =	33.4214	(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													
	1126.8414	847.0444	689.9841	358.0521	122.0642	0.0000	0.0000	0.0000	0.0000	352.5703	771.2620	1156.4682	(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)													
	1220.8466	917.7079	747.5451	387.9221	132.2473	0.0000	0.0000	0.0000	0.0000	381.9830	835.6034	1252.9449	(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													
	253.7448	224.2715	238.2496	209.8135	203.5332	183.5889	181.4836	188.6894	190.7249	212.4125	225.4808	251.0514	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9967	86.7518	86.3018	85.2477	82.9518	79.8000	79.8000	79.8000	79.8000	85.1879	86.5908	87.0489	(217)
Fuel for water heating, kWh/month													
	291.6719	258.5209	276.0657	246.1222	245.3631	230.0613	227.4230	236.4529	239.0036	249.3459	260.3981	288.4027	(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	36.4424	29.2355	26.3233	19.2856	14.8967	12.1708	13.5893	17.6639	22.9436	30.1033	34.0016	37.4553	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-56.5382	-79.3842	-113.6034	-127.0728	-136.3602	-126.9068	-125.2088	-118.4602	-106.5571	-90.3389	-61.9913	-48.9078	(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	-32.9242	-69.1527	-137.2971	-206.0462	-272.3588	-273.7462	-270.6513	-229.3076	-168.1842	-98.9902	-43.9778	-26.0546	(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												5876.8002	(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												3048.8314	(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)												294.1111	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3020.0206	(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												6285.7222	(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	5876.8002	0.2100	1234.1280	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3048.8314	0.2100	640.2546	(264)
Space and water heating			1874.3826	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	294.1111	0.1443	42.4493	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1191.3297	0.1347	-160.4827	
PV Unit electricity exported	-1828.6909	0.1259	-230.2470	
Total			-390.7298	(269)
Total CO2, kg/year			1538.0315	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.4800	(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	5876.8002	1.1300	6640.7843	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3048.8314	1.1300	3445.1795	(278)
Space and water heating			10085.9638	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	294.1111	1.5338	451.1175	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1191.3297	1.4979	-1784.4552	
PV Unit electricity exported	-1828.6909	0.4622	-845.1641	
Total			-2629.6193	(283)
Total Primary energy kWh/year			8037.5627	(286)
Target Primary Energy Rate (TPER)			49.5200	(287)

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Property Reference	BH1 L01-6 02 x6_Copy	Issued on Date	12/09/2023
Assessment Reference	BH1 L01 02_Copy	Prop Type Ref	
Property			

SAP Rating	89 B	DER	9.84	TER	11.27
Environmental	91 B	% DER < TER			12.69
CO_2 Emissions (t/year)	0.85	DFEE	27.71	TFEE	27.09
Compliance Check	See BREL	% DFEE < TFEE			-2.27
% DPER < TPER	9.03	DPER	49.78	TPER	54.72

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	99.7000 (1b)	x	2.7400 (2b)	=	273.1780 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		273.1780	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)

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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 = 1.30)			20.4500	1.2357	25.2709			(27)
External Wall 1	66.4998	20.4500	46.0498	0.1400	6.4470	190.0000	8749.4620	(29a)
Total net area of external elements Aum(A, m2)			66.4998					(31)

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Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	31.7179	(33)
Party Wall 1	66.4700	0.0000	0.0000	180.0000	11964.6000 (32)
Party Floor 1	99.7000			40.0000	3988.0000 (32d)
Party Ceiling 1	99.7000			30.0000	2991.0000 (32b)
Internal Wall 1	176.5300			75.0000	13239.7500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		40932.8120 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					410.5598 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.4100	0.0300	0.3423	
E3 Sill	7.9000	0.0300	0.2370	
E4 Jamb	24.9000	0.0300	0.7470	
E7 Party floor between dwellings (in blocks of flats)	48.5400	0.0700	3.3978	
E8 Balcony within a dwelling, wall insulation continuous	6.6000	0.0000	0.0000	
E16 Corner (normal)	5.4800	0.0900	0.4932	
E18 Party wall between dwellings	5.4800	0.0600	0.3288	
E17 Corner (inverted - internal area greater than external area)	2.7400	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.5461	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	37.2640	(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	26.9150	26.6277	26.3403	24.9036	24.6162	23.1795	23.1795	22.8921	23.7542	24.6162	25.1909	25.7656	(38)
Heat transfer coeff	64.1790	63.8917	63.6043	62.1676	61.8802	60.4435	60.4435	60.1561	61.0182	61.8802	62.4549	63.0296	(39)
Average = Sum(39)m / 12 =												62.0957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6437	0.6408	0.6380	0.6235	0.6207	0.6063	0.6063	0.6034	0.6120	0.6207	0.6264	0.6322	(40)
HLP (average)												0.6228	
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												2.7367	(42)
Hot water usage for mixer showers	96.3954	94.9468	92.8359	88.7969	85.8163	82.4924	80.6030	82.6980	84.9945	88.5634	92.6891	96.0261	(42a)
Hot water usage for baths	31.8642	31.3910	30.7246	29.4958	28.5758	27.5556	27.0045	27.6663	28.3868	29.4784	30.7325	31.7565	(42b)
Hot water usage for other uses	44.9020	43.2692	41.6364	40.0036	38.3708	36.7380	36.7380	38.3708	40.0036	41.6364	43.2692	44.9020	(42c)
Average daily hot water use (litres/day)												159.2365	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	173.1616	169.6069	165.1968	158.2964	152.7629	146.7859	144.3455	148.7350	153.3848	159.6782	166.6907	172.6846	(44)
Energy conte	274.2457	241.5180	253.9013	216.6998	205.6482	180.4904	174.5734	184.1650	189.1388	216.6818	237.4815	270.3823	(45)
Energy content (annual)										Total = Sum(45)m =		2644.9263	
Distribution loss (46)m = 0.15 x (45)m	41.1368	36.2277	38.0852	32.5050	30.8472	27.0736	26.1860	27.6248	28.3708	32.5023	35.6222	40.5573	(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	329.5225	291.4455	309.1781	270.1935	260.9250	233.9841	229.8502	239.4418	242.6325	271.9586	290.9751	325.6591	(62)
WWHRS	-73.1216	-64.6693	-67.7180	-56.0732	-52.2582	-44.7177	-41.9157	-44.5732	-46.2667	-54.5433	-61.7909	-71.7675	(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	256.4009	226.7761	241.4601	214.1203	208.6668	189.2664	187.9345	194.8687	196.3658	217.4153	229.1842	253.8916	(64)
										Total per year (kWh/year) = Sum(64)m =		2616.3507	(64)
12Total per year (kWh/year)												2616	(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	135.4081	120.2467	128.6436	114.8476	112.5995	102.8080	102.2671	105.4563	105.6836	116.2681	121.7575	134.1236	(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	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.0428	142.8689	129.0428	133.3443	129.0428	133.3443	129.0428	129.0428	133.3443	129.0428	133.3443	129.0428	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	255.8419	258.4967	251.8066	237.5642	219.5856	202.6883	191.3999	188.7451	195.4352	209.6776	227.6562	244.5534 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837 (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)												
	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693 (71)
Water heating gains (Table 5)												
	182.0002	178.9385	172.9081	159.5106	151.3434	142.7889	137.4558	141.7424	146.7828	156.2744	169.1077	180.2736 (72)
Total internal gains												
	630.9358	644.3551	617.8085	594.4700	564.0228	542.8725	521.9495	523.5813	539.6132	559.0458	594.1591	617.9208 (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	5.3500	10.6334	0.3300	0.8000	0.7700	10.4079	(74)
East	15.1000	19.6403	0.3300	0.8000	0.7700	54.2577	(76)

Solar gains	64.6656	126.0296	208.5948	309.2189	385.5583	398.1139	377.5791	319.5391	243.9320	149.6200	80.4925	53.2954	(83)
Total gains	695.6014	770.3847	826.4033	903.6889	949.5812	940.9864	899.5286	843.1203	783.5452	708.6658	674.6515	671.2163	(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	177.1642	177.9610	178.7650	182.8964	183.7457	188.1134	188.1134	189.0119	186.3416	183.7457	182.0549	180.3950	
alpha	12.8109	12.8641	12.9177	13.1931	13.2497	13.5409	13.5409	13.6008	13.4228	13.2497	13.1370	13.0263	
util living area													
	0.9986	0.9938	0.9678	0.8190	0.6057	0.4111	0.2957	0.3282	0.5373	0.8770	0.9916	0.9990	(86)
MIT	20.7135	20.8001	20.9069	20.9908	20.9998	21.0000	21.0000	21.0000	21.0000	20.9832	20.8484	20.7046	(87)
Th 2	20.3908	20.3934	20.3960	20.4089	20.4114	20.4244	20.4244	20.4270	20.4192	20.4114	20.4063	20.4011	(88)
util rest of house													
	0.9979	0.9909	0.9551	0.7839	0.5676	0.3741	0.2570	0.2873	0.4921	0.8389	0.9872	0.9985	(89)
MIT 2	20.1337	20.2213	20.3241	20.4034	20.4113	20.4244	20.4244	20.4270	20.4192	20.4018	20.2806	20.1342	(90)
Living area fraction									fLA = Living area / (4) =			0.2152	(91)
MIT	20.2585	20.3459	20.4495	20.5299	20.5380	20.5483	20.5483	20.5503	20.5442	20.5270	20.4028	20.2570	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2585	20.3459	20.4495	20.5299	20.5380	20.5483	20.5483	20.5503	20.5442	20.5270	20.4028	20.2570	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9906	0.9564	0.7913	0.5758	0.3821	0.2653	0.2961	0.5018	0.8468	0.9871	0.9984	(94)
Useful gains	694.0232	763.1636	790.3551	715.0463	546.7422	359.5340	238.6475	249.6666	393.1943	600.1224	665.9682	670.1388	(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													
	1024.1993	986.8614	887.2510	723.0007	546.8973	359.5345	238.6475	249.6666	393.2131	614.2830	830.8277	1012.0636	(97)
Space heating kWh													
	245.6510	150.3250	72.0905	5.7272	0.1154	0.0000	0.0000	0.0000	0.0000	10.5355	118.6988	254.3920	(98a)
Space heating requirement - total per year (kWh/year)												857.5354	
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													
	245.6510	150.3250	72.0905	5.7272	0.1154	0.0000	0.0000	0.0000	0.0000	10.5355	118.6988	254.3920	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												857.5354	
Space heating per m2											(98c) / (4) =	8.6012	(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 Combined Heat and Power-Space and Water	0.5580	(303a)
Fraction of heat from community Boilers-Space and Water	0.4420	(303b)
Factor for control and charging method (Table 4c(3)) for space heating	1.0500	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0500	(305a)
Distribution loss factor (Table 12c) for community heating system	1.2500	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		
245.6510 150.3250 72.0905 5.7272 0.1154 0.0000 0.0000 0.0000 0.0000 10.5355 118.6988 254.3920		(98)
Space heat from Combined Heat and Power = (98) x 0.56 x 1.05 x 1.25		
307a 179.9087 110.0942 52.7973 4.1945 0.0845 0.0000 0.0000 0.0000 0.0000 7.7159 86.9321 186.3104		
Space heat from Boilers = (98) x 0.44 x 1.05 x 1.25		
307b 142.5083 87.2073 41.8215 3.3225 0.0669 0.0000 0.0000 0.0000 0.0000 6.1119 68.8602 147.5792		

Space heating requirement												
	322.4169	197.3015	94.6188	7.5170	0.1514	0.0000	0.0000	0.0000	0.0000	13.8278	155.7922	333.8895 (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												
	256.4009	226.7761	241.4601	214.1203	208.6668	189.2664	187.9345	194.8687	196.3658	217.4153	229.1842	253.8916 (64)
Water heat from Combined Heat and Power = (64) x 0.56 x 1.05 x 1.25												
310a	187.7816	166.0852	176.8394	156.8163	152.8223	138.6140	137.6385	142.7169	143.8134	159.2295	167.8488	185.9439
Water heat from Boilers = (64) x 0.44 x 1.05 x 1.25												
310b	148.7446	131.5585	140.0771	124.2165	121.0528	109.7982	109.0255	113.0482	113.9167	126.1281	132.9555	147.2889
Water heating fuel												
	336.5261	297.6437	316.9164	281.0329	273.8752	248.4121	246.6640	255.7651	257.7302	285.3576	300.8043	333.2327 (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	16.6296	15.0203	16.6296	16.0932	16.6296	16.0932	16.6296	16.6296	16.0932	16.6296	16.0932	16.6296 (331)
Lighting	23.7070	19.0187	17.1242	12.5459	9.6908	7.9175	8.8403	11.4909	14.9256	19.5832	22.1192	24.3659 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-8.8455	-13.8495	-22.1373	-27.7786	-32.6053	-31.4419	-31.0318	-27.9065	-22.9726	-16.9728	-10.1931	-7.4930 (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												1125.5152 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												3433.9603 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												11.2552 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)												
mechanical ventilation fans (SFP = 0.5875)												195.8003 (330a)
Total electricity for the above, kWh/year												195.8003 (331)
Electricity for lighting (calculated in Appendix L)												191.3292 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-253.2279 (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												4693.3772 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Electrical efficiency of CHP unit			32.0000	(361)
Heat efficiency of CHP unit			49.9000	(362)
Space heating from Combined Heat and Power	1258.5921	0.2100	264.3043	(363)
less credit emissions for electricity	-402.7495	0.3480	-140.1568	(364)
Water heating from Combined Heat and Power	3839.9796	0.2100	806.3957	(365)
less credit emissions for electricity	-1228.7935	0.3480	-427.6201	(366)
Efficiency of heat source Boilers			93.9000	(367)
Space and Water heating from Boilers	2146.2068	0.2100	111.2570	(368)
Electrical energy for heat distribution (space & water)	11.2552	0.0000	6.6265	(372)
Overall CO2 factor for heat network			0.2106	(386)
Total CO2 associated with community systems			960.2531	(373)
Space and water heating			960.2531	(376)
Pumps, fans and electric keep-hot	195.8003	0.1387	27.1599	(378)
Energy for lighting	191.3292	0.1443	27.6147	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.2279	0.1324	-33.5355	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-33.5355	(380)
Total CO2, kg/year			981.4922	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.8400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Electrical efficiency of CHP unit			32.0000	(461)
Heat efficiency of CHP unit			49.9000	(462)
Space heating from Combined Heat and Power	1258.5921	1.1300	1422.2091	(463)
less credit emissions for electricity	-402.7495	2.1490	-865.5086	(464)

Water heating from Combined Heat and Power	3839.9796	1.1300	4339.1770 (465)
less credit emissions for electricity	-1228.7935	2.1490	-2640.6772 (466)
Efficiency of heat source Boilers			93.9000 (467b)
Space and Water heating from Boilers	2146.2068	1.1300	598.6686 (468)
Electrical energy for heat distribution (space & water)	11.2552	0.0000	70.1034 (472)
Overall CO2 factor for heat network			1.0419 (486)
Total CO2 associated with community systems			4750.5173 (473)
Space and water heating			4750.5173 (476)
Pumps, fans and electric keep-hot	195.8003	1.5128	296.2067 (478)
Energy for lighting	191.3292	1.5338	293.4672 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-253.2279	1.4893	-377.1378
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-377.1378 (480)
Total Primary energy kWh/year			4963.0534 (483)
Dwelling Primary energy Rate (DPER)			49.7800 (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	99.7000 (1b)	x	2.7400 (2b)	=	273.1780 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.7000				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		273.1780 (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	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) =	0.1098	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3598	(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) =	0.3058	(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	0.3900	0.3823	0.3747	0.3364	0.3288	0.2906	0.2906	0.2829	0.3058	0.3288	0.3441	0.3594	(22b)
Effective ac	0.5760	0.5731	0.5702	0.5566	0.5540	0.5422	0.5422	0.5400	0.5468	0.5540	0.5592	0.5646	(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)			20.4500	1.1450	23.4160			(27)
External Wall 1	66.4998	20.4500	46.0498	0.1800	8.2890			(29a)
Total net area of external elements Aum(A, m2)			66.4998					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.7050			(33)
Party Wall 1			66.4700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 420.5598 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4100	0.0500	0.5705
E3 Sill	7.9000	0.0500	0.3950
E4 Jamb	24.9000	0.0500	1.2450
E7 Party floor between dwellings (in blocks of flats)	48.5400	0.0700	3.3978
E8 Balcony within a dwelling, wall insulation continuous	6.6000	0.0000	0.0000
E16 Corner (normal)	5.4800	0.0900	0.4932
E18 Party wall between dwellings	5.4800	0.0600	0.3288
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) 6.1837 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.8887 (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	51.9285	51.6624	51.4015	50.1761	49.9469	48.8796	48.8796	48.6820	49.2907	49.9469	50.4107	50.8955	(38)
Heat transfer coeff	89.8172	89.5511	89.2902	88.0648	87.8356	86.7683	86.7683	86.5707	87.1794	87.8356	88.2994	88.7842	(39)
Average = Sum(39)m / 12 =												88.0637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9009	0.8982	0.8956	0.8833	0.8810	0.8703	0.8703	0.8683	0.8744	0.8810	0.8857	0.8905	(40)
HLP (average)												0.8833	
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 2.7367 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.1058	69.0522	67.5170	64.5796	62.4119	59.9944	58.6204	60.1440	61.8142	64.4097	67.4102	69.8372	(42a)
Hot water usage for baths	30.2710	29.8214	29.1883	28.0211	27.1470	26.1778	25.6543	26.2830	26.9674	28.0045	29.1958	30.1687	(42b)
Hot water usage for other uses	42.6569	41.1057	39.5545	38.0034	36.4522	34.9011	34.9011	36.4522	38.0034	39.5545	41.1057	42.6569	(42c)
Average daily hot water use (litres/day)												131.4801	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.0336	139.9794	136.2599	130.6040	126.0111	121.0733	119.1758	122.8792	126.7850	131.9688	137.7118	142.6627	(44)
Energy conte	226.5303	199.3287	209.4264	178.7904	169.6352	148.8738	144.1327	152.1501	156.3386	179.0804	196.1957	223.3753	(45)
Energy content (annual)											Total = Sum(45)m =	2183.8576	
Distribution loss (46)m = 0.15 x (45)m	33.9795	29.8993	31.4140	26.8186	25.4453	22.3311	21.6199	22.8225	23.4508	26.8621	29.4294	33.5063	(46)
Water storage loss:													
Store volume												0.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												1.4400	(51)
Volume factor from Table 2a												0.0000	(52)
Temperature factor from Table 2b												1.0000	(53)
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	271.1703	239.6487	254.0664	221.9904	214.2752	192.0738	188.7727	196.7901	199.5386	223.7204	239.3957	268.0153	(62)
WWHRS	-32.0494	-28.3448	-29.6810	-24.5771	-22.9049	-19.5999	-18.3718	-19.5366	-20.2788	-23.9065	-27.0832	-31.4559	(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	239.1209	211.3040	224.3853	197.4133	191.3702	172.4739	170.4010	177.2535	179.2598	199.8139	212.3125	236.5594	(64)
										Total per year (kWh/year) = Sum(64)m =		2411.6677	(64)
12Total per year (kWh/year)												2412	(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	111.0333	98.5328	105.3463	94.0078	92.1157	84.0605	83.6361	86.3019	86.5426	95.2562	99.7951	109.9843	(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	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	136.8366	(66)
(66)m													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.6372	143.5269	129.6372	133.9585	129.6372	133.9585	129.6372	129.6372	133.9585	129.6372	133.9585	129.6372	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	255.8419	258.4967	251.8066	237.5642	219.5856	202.6883	191.3999	188.7451	195.4352	209.6776	227.6562	244.5534	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	36.6837	(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)	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	-109.4693	(71)
Water heating gains (Table 5)	149.2383	146.6262	141.5944	130.5664	123.8114	116.7507	112.4142	115.9972	120.1980	128.0326	138.6043	147.8283	(72)
Total internal gains													

	598.7684	612.7008	587.0892	566.1400	537.0852	517.4485	497.5023	498.4305	513.6426	531.3984	564.2698	586.0700 (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	5.3500	10.6334	0.6300	0.7000	0.7700	17.3859	(74)
East	15.1000	19.6403	0.6300	0.7000	0.7700	90.6350	(76)

Solar gains	108.0209	210.5267	348.4481	516.5362	644.0577	665.0312	630.7288	533.7755	407.4774	249.9334	134.4590	89.0276	(83)
Total gains	706.7893	823.2275	935.5373	1082.6761	1181.1429	1182.4797	1128.2310	1032.2059	921.1200	781.3318	698.7288	675.0976	(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	129.6763	130.0617	130.4418	132.2568	132.6020	134.2330	134.2330	134.5395	133.6000	132.6020	131.9055	131.1851	
alpha	9.6451	9.6708	9.6961	9.8171	9.8401	9.9489	9.9489	9.9693	9.9067	9.8401	9.7937	9.7457	
util living area	0.9996	0.9981	0.9877	0.9002	0.6858	0.4695	0.3384	0.3858	0.6497	0.9619	0.9983	0.9998	(86)
MIT	20.4290	20.5536	20.7331	20.9344	20.9951	20.9999	21.0000	21.0000	20.9978	20.8832	20.6180	20.4115	(87)
Th 2	20.1668	20.1690	20.1713	20.1817	20.1837	20.1928	20.1928	20.1945	20.1893	20.1837	20.1797	20.1756	(88)
util rest of house	0.9994	0.9970	0.9812	0.8640	0.6284	0.4104	0.2763	0.3182	0.5753	0.9378	0.9971	0.9996	(89)
MIT 2	19.5030	19.6641	19.8915	20.1279	20.1809	20.1928	20.1928	20.1945	20.1884	20.0827	19.7558	19.4880	(90)
Living area fraction									fLA = Living area / (4) =			0.2152	(91)
MIT	19.7023	19.8556	20.0726	20.3015	20.3562	20.3665	20.3666	20.3679	20.3626	20.2550	19.9413	19.6868	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7023	19.8556	20.0726	20.3015	20.3562	20.3665	20.3666	20.3679	20.3626	20.2550	19.9413	19.6868	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9992	0.9965	0.9802	0.8698	0.6407	0.4231	0.2897	0.3328	0.5914	0.9403	0.9966	0.9995	(94)
Useful gains	706.2573	820.3447	917.0310	941.6809	756.7385	500.2948	326.8173	343.4990	544.7177	734.7038	696.3765	674.7622	(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	1383.3936	1339.2865	1211.9024	1004.0709	760.3194	500.3503	326.8183	343.5029	545.9715	848.0521	1133.8825	1374.9854	(97)
Space heating kWh	503.7895	348.7289	219.3843	44.9208	2.6642	0.0000	0.0000	0.0000	0.0000	84.3311	315.0043	520.9661	(98a)
Space heating requirement - total per year (kWh/year)												2039.7892	
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	503.7895	348.7289	219.3843	44.9208	2.6642	0.0000	0.0000	0.0000	0.0000	84.3311	315.0043	520.9661	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2039.7892	
Space heating per m2											(98c) / (4) =	20.4593	(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 Combined Heat and Power-Space and Water	0.5580	(303a)
Fraction of heat from community Boilers-Space and Water	0.4420	(303b)
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	1.2500	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement	503.7895	348.7289	219.3843	44.9208	2.6642	0.0000	0.0000	0.0000	0.0000	84.3311	315.0043	520.9661	(98)
Space heat from Combined Heat and Power = (98) x 0.56 x 1.00 x 1.25													
307a	351.3932	243.2384	153.0206	31.3322	1.8583	0.0000	0.0000	0.0000	0.0000	58.8210	219.7155	363.3739	
Space heat from Boilers = (98) x 0.44 x 1.00 x 1.25													
307b	278.3437	192.6727	121.2098	24.8187	1.4720	0.0000	0.0000	0.0000	0.0000	46.5930	174.0399	287.8338	
Space heating requirement	629.7368	435.9111	274.2304	56.1510	3.3302	0.0000	0.0000	0.0000	0.0000	105.4139	393.7554	651.2076	(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	239.1209	211.3040	224.3853	197.4133	191.3702	172.4739	170.4010	177.2535	179.2598	199.8139	212.3125	236.5594	(64)
Water heat from Combined Heat and Power = (64) x 0.56 x 1.00 x 1.25													

310a	166.7868	147.3845	156.5088	137.6958	133.4807	120.3005	118.8547	123.6343	125.0337	139.3702	148.0880	165.0002	
Water heat from Boilers = (64) x 0.44 x 1.00 x 1.25													
310b	132.1143	116.7454	123.9729	109.0709	105.7320	95.2918	94.1465	97.9326	99.0410	110.3972	117.3027	130.6991	
Water heating fuel	298.9011	264.1300	280.4817	246.7667	239.2128	215.5923	213.0012	221.5669	224.0747	249.7674	265.3906	295.6992	(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	26.9361	21.6091	19.4566	14.2547	11.0108	8.9959	10.0444	13.0561	16.9586	22.2505	25.1319	27.6847	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.4370	-22.0056	-34.1563	-41.5519	-47.6106	-45.4456	-44.8621	-40.9265	-34.5465	-26.4648	-16.4377	-12.2948	(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	-3.8106	-8.2913	-17.0196	-26.3940	-35.7554	-36.2752	-35.8811	-30.0073	-21.4921	-12.1525	-5.1767	-2.9952	(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												2549.7365	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3014.5846	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.4974	(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)												217.3894	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-615.9903	(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												5165.7202	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Electrical efficiency of CHP unit			32.0000	(361)
Heat efficiency of CHP unit			49.9000	(362)
Space heating from Combined Heat and Power	2851.2084	0.2100	598.7538	(363)
less credit emissions for electricity	-912.3867	0.3480	-317.5106	(364)
Water heating from Combined Heat and Power	3371.0184	0.2100	707.9139	(365)
less credit emissions for electricity	-1078.7259	0.3480	-375.3966	(366)
Efficiency of heat source Boilers			93.9000	(367)
Space and Water heating from Boilers	2619.2012	0.2100	252.0410	(368)
Electrical energy for heat distribution (space & water)	25.4974	0.0000	8.2743	(372)
Overall CO2 factor for heat network			0.2106	(386)
Total CO2 associated with community systems			1172.0670	(373)
Space and water heating			1172.0670	(376)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(378)
Energy for lighting	217.3894	0.1443	31.3760	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-380.7394	0.1330	-50.6435	
PV Unit electricity exported	-235.2509	0.1249	-29.3944	
Total			-80.0379	(380)
Total CO2, kg/year			1123.4051	(383)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Electrical efficiency of CHP unit			32.0000	(461)
Heat efficiency of CHP unit			49.9000	(462)
Space heating from Combined Heat and Power	2851.2084	1.1300	3221.8654	(463)
less credit emissions for electricity	-912.3867	2.1490	-1960.7190	(464)
Water heating from Combined Heat and Power	3371.0184	1.1300	3809.2508	(465)
less credit emissions for electricity	-1078.7259	2.1490	-2318.1820	(466)
Efficiency of heat source Boilers			93.9000	(467b)
Space and Water heating from Boilers	2619.2012	1.1300	1356.2209	(468)
Electrical energy for heat distribution (space & water)	25.4974	0.0000	86.2550	(472)
Overall CO2 factor for heat network			1.0420	(486)
Total CO2 associated with community systems			5798.1677	(473)
Space and water heating			5798.1677	(476)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(478)
Energy for lighting	217.3894	1.5338	333.4391	(479)

Energy saving/generation technologies

PV Unit electricity used in dwelling	-380.7394	1.4915	-567.8750
PV Unit electricity exported	-235.2509	0.4586	-107.8861
Total			-675.7611 (480)
Total Primary energy kWh/year			5455.8456 (483)
Target Primary Energy Rate (TPER)			54.7200 (484)