

Property Reference	Flat 3				Issued on Date	14/06/2023
Assessment Reference	Flat 3		Prop Type Ref			
Property						
SAP Rating	83 B	DER	4.91	TER	13.73	
Environmental	96 A	% DER < TER			64.24	
CO ₂ Emissions (t/year)	0.24	DFEE	48.48	TFEE	32.72	
Compliance Check	See BREL	% DFEE < TFEE			48.15	
% DPER < TPER	29.82	DPER	51.21	TPER	72.97	
Assessor Details	Mr. George Farr				Assessor ID	T355-0001
ΥΠΟΛΟΓΙΣΜΟΣ ΕΝΕΡΓΕΙΑΣ						

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

1. Overall dwelling characteristics

		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor		57.7200 (1b)	x 2.6500 (2b)	= 152.9580 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.7200			
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.9580 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3808 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3808 (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	0.4855	0.4759	0.4664	0.4188	0.4093	0.3617	0.3617	0.3522	0.3808	0.4093	0.4283	0.4474 (22b)
Effective ac	0.6178	0.6133	0.6088	0.5877	0.5838	0.5654	0.5654	0.5620	0.5725	0.5838	0.5917	0.6001 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
G (U _w = 1.10)			15.6000	1.0536	16.4368		(27)
DOOR			2.0300	1.1000	2.2330		(26)
PROPOSED GF			57.7200	0.1400	8.0808	110.0000	6349.2000 (28a)
EXISTING EW	15.8900	7.5200	8.3700	0.2800	2.3436	9.0000	75.3300 (29a)
PROPOSED EW	33.3700	10.1100	23.2600	0.1400	3.2564	60.0000	1395.6000 (29a)
PROPOSED FR	9.7600		9.7600	0.1100	1.0736	9.0000	87.8400 (30)
Total net area of external elements A _{um} (A, m ²)			116.7400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 33.4242		(33)

Party Wall	51.0400	0.0000	0.0000	45.0000	2296.8000 (32)
PC	47.9700			30.0000	1439.1000 (32b)
Internal Wall 1	91.4800			75.0000	6861.0000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18504.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 320.5972 (35)

List of Thermal Bridges					
K1 Element	Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)	35.0000	0.5000	17.5000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				17.5000 (36)	
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =	50.9242 (37)

Energy Saving Calculation Summary	ed monthly (38)m = 0.33 x (25)m x (5)												
(38)m	31.1860	30.9551	30.7287	29.6653	29.4664	28.5402	28.5402	28.3687	28.8969	29.4664	29.8688	30.2896 (38)	
Heat transfer coeff	82.1102	81.8792	81.6528	80.5895	80.3905	79.4644	79.4644	79.2929	79.8211	80.3905	80.7930	81.2138 (39)	
Average = Sum(39)m / 12 =												80.5885	
HLP	Jan 1.4226	Feb 1.4186	Mar 1.4146	Apr 1.3962	May 1.3928	Jun 1.3767	Jul 1.3767	Aug 1.3738	Sep 1.3829	Oct 1.3928	Nov 1.3997	Dec 1.4070 (40)	
HLP (average)												1.3962	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9165 (42)
Hot water usage for mixer showers	56.3528	55.5059	54.2719	51.9107	50.1683	48.2251	47.1206	48.3453	49.6878	51.7742	54.1861	56.1369 (42a)	
Hot water usage for baths	24.3568	23.9950	23.4857	22.5464	21.8431	21.0633	20.6421	21.1479	21.6987	22.5331	23.4917	24.2744 (42b)	
Hot water usage for other uses	34.2568	33.0111	31.7654	30.5197	29.2740	28.0283	28.0283	29.2740	30.5197	31.7654	33.0111	34.2568 (42c)	
Average daily hot water use (litres/day)												105.6805 (43)	
Daily hot water use	Jan 114.9664	Feb 112.5121	Mar 109.5229	Apr 104.9768	May 101.2854	Jun 97.3167	Jul 95.7909	Aug 98.7672	Sep 101.9062	Oct 106.0727	Nov 110.6888	Dec 114.6681 (44)	
Energy content (annual)	182.0786	160.2157	168.3326	143.7080	136.3496	119.6622	115.8508	122.2944	125.6605	143.9396	157.6965	179.5426 (45)	
Distribution loss (46)m = 0.15 x (45)m	27.3118	24.0324	25.2499	21.5562	20.4524	17.9493	17.3776	18.3442	18.8491	21.5909	23.6545	26.9314 (46)	
Water storage loss:													
Store volume												210.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.4200 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7668 (55)	
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)	
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (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	229.1118	202.6973	215.3658	189.2240	183.3828	165.1782	162.8840	169.3276	171.1765	190.9728	203.2125	226.5758 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	-2.9192	-6.6714	-14.5342	-23.7938	-33.0374	-33.8087	-33.2760	-27.1118	-18.6394	-9.9522	-4.0062	-2.2535 (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	226.1927	196.0259	200.8316	165.4303	150.3454	131.3695	129.6080	142.2157	152.5371	181.0206	199.2063	224.3223 (64)	
Total per year (kWh/year)												2099.1054 (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	98.1677	87.2570	93.5972	84.1957	82.9628	76.2005	76.1470	78.2894	78.1949	85.4865	88.8469	97.3245 (65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 95.8246	Feb 95.8246	Mar 95.8246	Apr 95.8246	May 95.8246	Jun 95.8246	Jul 95.8246	Aug 95.8246	Sep 95.8246	Oct 95.8246	Nov 95.8246	Dec 95.8246 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.3142	93.3479	84.3142	87.1247	84.3142	87.1247	84.3142	84.3142	87.1247	84.3142	87.1247	84.3142 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.1623	168.8970	164.5258	155.2200	143.4732	132.4328	125.0572	123.3225	127.6937	136.9995	148.7463	159.7867 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.5825	32.5825	32.5825	32.5825	32.5825	32.5825	32.5825	32.5825	32.5825	32.5825	32.5825	32.5825 (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)	-76.6597	-76.6597	-76.6597	-76.6597	-76.6597	-76.6597	-76.6597	-76.6597	-76.6597	-76.6597	-76.6597	-76.6597 (71)	
Water heating gains (Table 5)	131.9458	129.8467	125.8026	116.9385	111.5091	105.8340	102.3481	105.2277	108.6040	114.9012	123.3985	130.8125 (72)	
Total internal gains	435.1698	443.8389	426.3900	411.0306	391.0439	377.1389	363.4668	364.6119	375.1698	387.9623	411.0168	426.6607 (73)	

Solar gains	114.4823	201.5032	292.9639	391.9241	465.3915	473.6402	451.8064	395.2209	326.9548	227.3573	138.3067	97.2074 (83)
Total gains	549.6521	645.3421	719.3539	802.9547	856.4354	850.7791	815.2732	759.8327	702.1246	615.3195	549.3235	523.8681 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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Utilisation factor for gains for living area, $ni_{1,m}$ (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	62.6017	62.7783	62.9524	63.7830	63.9409	64.6861	64.6861	64.8260	64.3970	63.9409	63.6224	63.2927
alpha	5.1734	5.1852	5.1968	5.2522	5.2627	5.3124	5.3124	5.3217	5.2931	5.2627	5.2415	5.2195
util living area	0.9947	0.9873	0.9691	0.9095	0.7783	0.5815	0.4261	0.4750	0.7247	0.9384	0.9878	0.9958 (86)
Living	20.0379	20.1945	20.4070	20.6720	20.8520	20.9264	20.9392	20.9375	20.8953	20.6568	20.3037	20.0164
Non living	18.6543	18.8547	19.1216	19.4455	19.6309	19.6999	19.7059	19.7078	19.6775	19.4397	19.0061	18.6365
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	20.5078	20.1945	20.4070	20.6720	20.8520	20.9264	20.9392	20.9375	20.8953	20.6568	20.3037	20.1540 (87)
Th 2	19.7461	19.7491	19.7521	19.7662	19.7689	19.7812	19.7812	19.7835	19.7765	19.7689	19.7635	19.7579 (88)
util rest of house	0.9925	0.9821	0.9564	0.8741	0.7058	0.4786	0.3096	0.3522	0.6213	0.9057	0.9818	0.9941 (89)
MIT 2	19.3108	18.8547	19.1216	19.4455	19.6309	19.6999	19.7059	19.7078	19.6775	19.4397	19.0061	18.8386 (90)
Living area fraction									fLA =	Living area / (4) =		0.4172 (91)
MIT	19.8102	19.4136	19.6579	19.9572	20.1403	20.2116	20.2204	20.2208	20.1855	19.9475	19.5474	19.3873 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8102	19.4136	19.6579	19.9572	20.1403	20.2116	20.2204	20.2208	20.1855	19.9475	19.5474	19.3873 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9926	0.9803	0.9552	0.8804	0.7293	0.5159	0.3520	0.3969	0.6582	0.9114	0.9805	0.9934 (94)
Useful gains	545.5853	632.6126	687.1108	706.9214	624.5916	438.9443	286.9548	301.5936	462.1316	560.7854	538.6034	520.3997 (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	1273.5452	1188.3627	1074.3766	891.0950	678.5241	445.9222	287.6916	302.9634	485.7530	751.4506	1005.6668	1233.4212 (97)
Space heating kwh	541.6021	373.4641	288.1257	132.6049	40.1257	0.0000	0.0000	0.0000	0.0000	141.8549	336.2856	530.4880 (98a)
Space heating requirement - total per year (kwh/year)												2384.5511
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	541.6021	373.4641	288.1257	132.6049	40.1257	0.0000	0.0000	0.0000	0.0000	141.8549	336.2856	530.4880 (98c)
Space heating requirement after solar contribution - total per year (kwh/year)												2384.5511
Space heating per m2											(98c) / (4) =	41.3124 (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 %)	235.2200	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

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	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	1013.7535	1.5790	1600.6692 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1185.5110	1.5257	1808.7679 (278)
Space and water heating			3409.4371 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	144.6314	1.5338	221.8404 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-437.7011	1.4920	-653.0339
PV Unit electricity exported	-53.5087	0.4175	-22.3418
Total			-675.3757 (283)
Total Primary energy kWh/year			2955.9018 (286)
Dwelling Primary energy Rate (DPER)			51.2100 (287)

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

1. Overall dwelling characteristics

		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor		57.7200 (1b)	x 2.6500 (2b)	= 152.9580 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.7200			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	152.9580 (5)

2. Ventilation rate

			m ³ per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) =	0.1308 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3808	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3808 (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												
	0.4855	0.4759	0.4664	0.4188	0.4093	0.3617	0.3617	0.3522	0.3808	0.4093	0.4283	0.4474 (22b)
Effective ac	0.6178	0.6133	0.6088	0.5877	0.5838	0.5654	0.5654	0.5620	0.5725	0.5838	0.5917	0.6001 (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			2.0300	1.0000	2.0300		(26)					
TER Opening Type (Uw = 1.20)			12.4000	1.1450	14.1985		(27)					
PROPOSED GF			57.7200	0.1300	7.5036		(28a)					
EXISTING EW	15.8900	6.3900	9.5000	0.1800	1.7100		(29a)					
PROPOSED EW	33.3700	8.0400	25.3300	0.1800	4.5594		(29a)					
PROPOSED FR	9.7600		9.7600	0.1100	1.0736		(30)					
Total net area of external elements Aum(A, m2)			116.7400				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.0751		(33)					
Party Wall			51.0400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							328.9080 (35)					
List of Thermal Bridges												
K1 Element				Length 35.0000	Psi-value 0.0500	Total 1.7500						
E2 Other lintels (including other steel lintels)							1.7500 (36)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							(36a) = 0.0000					
Point Thermal bridges						(33) + (36) + (36a) =	32.8251 (37)					
Total fabric heat loss												
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.1860	Feb 30.9551	Mar 30.7287	Apr 29.6653	May 29.4664	Jun 28.5402	Jul 28.5402	Aug 28.3687	Sep 28.8969	Oct 29.4664	Nov 29.8688	Dec 30.2896 (38)
Heat transfer coeff	64.0111	63.7801	63.5537	62.4904	62.2914	61.3653	61.3653	61.1938	61.7220	62.2914	62.6939	63.1147 (39)
Average = Sum(39)m / 12 =												62.4894
HLP	Jan 1.1090	Feb 1.1050	Mar 1.1011	Apr 1.0826	May 1.0792	Jun 1.0632	Jul 1.0632	Aug 1.0602	Sep 1.0693	Oct 1.0792	Nov 1.0862	Dec 1.0935 (40)
HLP (average)												1.0826
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.3840	82.6824	82.9769	84.3889	84.6584	85.9361	85.9361	86.1769	85.4394	84.6584	84.1149	83.5541
alpha	6.4923	6.5122	6.5318	6.6259	6.6439	6.7291	6.7291	6.7451	6.6960	6.6439	6.6077	6.5703
util living area	0.9938	0.9837	0.9566	0.8646	0.6927	0.4897	0.3525	0.3921	0.6261	0.9025	0.9833	0.9952 (86)
MIT	20.2099	20.3895	20.6115	20.8560	20.9707	20.9975	20.9998	20.9995	20.9882	20.8348	20.4903	20.1869 (87)
Th 2	19.9935	19.9968	20.0000	20.0150	20.0179	20.0310	20.0310	20.0335	20.0260	20.0179	20.0121	20.0062 (88)
util rest of house	0.9914	0.9774	0.9408	0.8243	0.6287	0.4167	0.2750	0.3100	0.5434	0.8623	0.9758	0.9933 (89)
MIT 2	19.1007	19.3287	19.6024	19.8895	19.9985	20.0300	20.0310	20.0334	20.0202	19.8776	19.4695	19.0815 (90)
AF Calculation Formula	$f_{LA} = \text{Living area} / (4) =$											
	0.7712	0.7712	0.7712	0.7712	0.7712	0.7712	0.7712	0.7712	0.7712	0.7712	0.7712	0.7712
Temperature adjustment												0.0000
adjusted MIT	19.5635	19.7712	20.0234	20.2927	20.4041	20.4336	20.4351	20.4364	20.4241	20.2769	19.8954	19.5427 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9900	0.9757	0.9412	0.8365	0.6546	0.4472	0.3073	0.3443	0.5779	0.8741	0.9747	0.9921 (94)
Useful gains	538.5091	613.7913	651.3138	638.7672	528.9798	357.0851	235.2867	246.8827	385.8043	520.9022	527.0537	516.1690 (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												
Space heating kWh	977.0322	948.4902	859.4612	711.9350	542.1911	357.9805	235.3449	247.0050	390.3331	602.7881	802.1936	968.3486 (97)
Space heating requirement - total per year (kWh/year)	326.2611	224.9177	154.8617	52.6809	9.8292	0.0000	0.0000	0.0000	0.0000	60.9231	198.1007	336.4216 (98a)
Solar heating kWh												1363.9960
Solar heating contribution - total per year (kWh/year)	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)
Space heating kWh												0.0000
Space heating requirement after solar contribution - total per year (kWh/year)	326.2611	224.9177	154.8617	52.6809	9.8292	0.0000	0.0000	0.0000	0.0000	60.9231	198.1007	336.4216 (98c)
Space heating per m2												1363.9960
										(98c) / (4) =		23.6313 (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	326.2611	224.9177	154.8617	52.6809	9.8292	0.0000	0.0000	0.0000	0.0000	60.9231	198.1007	336.4216	(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)	353.4790	243.6811	167.7808	57.0757	10.6492	0.0000	0.0000	0.0000	0.0000	66.0056	214.6269	364.4871	(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	208.0631	184.1703	196.2209	174.0297	169.6846	153.9846	152.8297	158.3370	159.4372	176.4696	186.0037	206.0041	(64)	
Efficiency of water heater	85.0643	84.5091	83.5345	81.7247	80.2453	79.8000	79.8000	79.8000	79.8000	81.9310	84.2013	79.8000	(216)	
Fuel for water heating, kWh/month	244.5952	217.9295	234.8981	212.9463	211.4573	192.9632	191.5159	198.4173	199.7960	215.3879	220.9035	241.9232	(219)	
Space cooling fuel requirement	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	17.5424	14.0732	12.6713	9.2836	7.1709	5.8587	6.5415	8.5029	11.0445	14.4909	16.3675	18.0300	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-15.5669	-23.1190	-34.9919	-41.5066	-46.6772	-44.2895	-43.7640	-40.3654	-34.7008	-27.3884	-17.5301	-13.3262	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-5.5615	-11.9610	-24.2633	-37.1662	-49.8500	-50.3328	-49.7264	-41.7670	-30.1849	-17.3255	-7.4966	-4.3777	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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													1477.7855	(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	2582.7333 (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)	141.5774 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-713.2389 (233)
Wind generation	0.0000 (234)
Appendix N	0.0000 (235a)
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	3574.8572 (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	1477.7855	0.2100	310.3349 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2582.7333	0.2100	542.3740 (264)
Space and water heating			852.7089 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	141.5774	0.1443	20.4340 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-383.2260	0.1335	-51.1580
PV Unit electricity exported	-330.0129	0.1253	-41.3608
Total			-92.5189 (269)
Total CO2, kg/year			792.5533 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7300 (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	1477.7855	1.1300	1669.8976 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2582.7333	1.1300	2918.4886 (278)
Space and water heating			4588.3862 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	141.5774	1.5338	217.1561 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-383.2260	1.4933	-572.2735
PV Unit electricity exported	-330.0129	0.4600	-151.8140
Total			-724.0875 (283)
Total Primary energy kWh/year			4211.5555 (286)
Target Primary Energy Rate (TPER)			72.9700 (287)

Water heating gains (Table 5)

Water heating gains	130.7232	128.6557	124.6724	115.9414	110.5936	105.0038	101.5702	104.4066	107.7321	113.9347	122.3043	129.6069 (72)
Total internal gains	426.4879	434.9016	417.8707	402.8176	383.3005	369.7000	356.3518	357.4998	367.8156	380.3403	402.8793	418.1924 (73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains			
				m2	Table 6a	Specific data		Specific data		factor		W			
AP Calculation Example					W/m2	or Table 6b		or Table 6c		Table 6d					
Northeast				12.1500	11.2829	0.5700		0.7000		0.7700		37.9057 (75)			
Southeast				4.9600	36.7938	0.5700		0.7000		0.7700		50.4618 (77)			
Southwest				3.2700	36.7938	0.5700		0.7000		0.7700		33.2682 (79)			
Solar gains				121.6357	219.7813	334.1577	470.0936	577.7094	596.0377	565.2780	481.5510	380.6902	251.9224	147.9844	102.6111 (83)
Total gains				548.1236	654.6829	752.0284	872.9112	961.0099	965.7377	921.6298	839.0508	748.5058	632.2627	550.8637	520.8036 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
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	67.6025	67.8108	68.0147	68.9927	69.1788	70.0586	70.0586	70.2240	69.7171	69.1788	68.8033	68.4151
alpha	5.5068	5.5207	5.5343	5.5995	5.6119	5.6706	5.6706	5.6816	5.6478	5.6119	5.5869	5.5610
util living area	0.9955	0.9877	0.9646	0.8797	0.7085	0.5038	0.3661	0.4186	0.6784	0.9320	0.9888	0.9966 (86)
Living	20.1117	20.2733	20.4953	20.7568	20.8989	20.9396	20.9445	20.9438	20.9182	20.7102	20.3665	20.0904
Non living	18.7404	18.9472	19.2238	19.5350	19.6707	19.7118	19.7138	19.7162	19.6960	19.4977	19.0796	18.7238
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	20.5456	20.2733	20.4953	20.7568	20.8989	20.9396	20.9445	20.9438	20.9182	20.7102	20.3665	20.2176 (87)
Th 2	19.7459	19.7492	19.7525	19.7678	19.7707	19.7841	19.7841	19.7866	19.7789	19.7707	19.7649	19.7588 (88)
util rest of house	0.9935	0.9823	0.9494	0.8360	0.6315	0.4110	0.2654	0.3092	0.5738	0.8952	0.9830	0.9950 (89)
MIT 2	19.3450	18.9472	19.2238	19.5350	19.6707	19.7118	19.7138	19.7162	19.6960	19.4977	19.0796	18.9103 (90)
Living area fraction	19.8745	19.5321	19.7846	20.0738	20.2124	20.2533	20.2566	20.2577	20.2350	20.0324	19.6472	0.4411 (91)
MIT	19.8745	19.5321	19.7846	20.0738	20.2124	20.2533	20.2566	20.2577	20.2350	20.0324	19.6472	19.4869 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8745	19.5321	19.7846	20.0738	20.2124	20.2533	20.2566	20.2577	20.2350	20.0324	19.6472	19.4869 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9938	0.9812	0.9499	0.8481	0.6604	0.4472	0.3047	0.3519	0.6146	0.9044	0.9822	0.9946 (94)
Useful gains	544.7008	642.3487	714.3300	740.2823	634.6448	431.9103	280.8059	295.2798	460.0291	571.8215	541.0751	517.9856 (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	1240.5115	1161.8812	1051.7080	872.0640	662.5618	434.5020	281.0383	295.7927	473.8352	734.1763	981.9430	1203.1391 (97)
Space heating kWh	517.6831	349.1259	251.0092	94.8828	20.7703	0.0000	0.0000	0.0000	0.0000	120.7920	317.4249	509.7542 (98a)
Space heating requirement - total per year (kWh/year)												2181.4423
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	517.6831	349.1259	251.0092	94.8828	20.7703	0.0000	0.0000	0.0000	0.0000	120.7920	317.4249	509.7542 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2181.4423
Space heating per m2												(98c) / (4) = 38.9682 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)

[illegible]

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	927.4051	1.5811	1466.2823 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1169.6164	1.5258	1784.5953 (278)
Space and water heating			3250.8775 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	139.3114	1.5338	213.6805 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-433.7481	1.4920	-647.1348
PV Unit electricity exported	-55.6232	0.4214	-23.4373
Total			-670.5720 (283)
Total Primary energy kwh/year			2793.9860 (286)
Dwelling Primary energy Rate (DPER)			49.9100 (287)

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

Energy Saving Calculation Worksheet

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	3.5000 (1b)	x 3.0500 (2b)	= 10.6750 (1b) -
First floor	52.4800 (1c)	x 3.2000 (2c)	= 167.9360 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	178.6110 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) =	0.1120 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3620 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3620 (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	0.4615	0.4525	0.4434	0.3982	0.3891	0.3439	0.3439	0.3348	0.3620	0.3891	0.4072	0.4253 (22b)
Effective ac	0.6065	0.6024	0.5983	0.5793	0.5757	0.5591	0.5591	0.5561	0.5655	0.5757	0.5829	0.5904 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0300	1.0000	2.0300		(26)
TER Opening Type (Uw = 1.20)			11.9600	1.1450	13.6947		(27)
PROPOSED GF			3.5000	0.1300	0.4550		(28a)
EXISTING EW	16.5900	9.1600	7.4300	0.1800	1.3374		(29a)
PROPOSED EW	50.4100	4.8300	45.5800	0.1800	8.2044		(29a)
PROPOSED FR	9.7800		9.7800	0.1100	1.0758		(30)
Total net area of external elements Aum(A, m ²)			80.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.7973		(33)
Party Wall			69.2500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							353.9007 (35)
List of Thermal Bridges							
K1 Element				Length 24.1000	Psi-value 0.0500	Total 1.2050	
E2 Other lintels (including other steel lintels)							1.2050 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000 (36a)
Point Thermal bridges							(33) + (36) + (36a) =
Total fabric heat loss							28.0023 (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	35.7481	35.5043	35.2654	34.1432	33.9332	32.9558	32.9558	32.7748	33.3323	33.9332	34.3580	34.8020 (38)
Heat transfer coeff	63.7503	63.5066	63.2677	62.1454	61.9355	60.9580	60.9580	60.7770	61.3345	61.9355	62.3602	62.8043 (39)
Average = Sum(39)m / 12 =												62.1444

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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HLP	1.1388	1.1345	1.1302	1.1101	1.1064	1.0889	1.0889	1.0857	1.0957	1.1064	1.1140	1.1219 (40)
HLP (average)												1.1101
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.8660 (42)
Hot water usage for mixer showers	55.5064	54.6722	53.4567	51.1310	49.4147	47.5007	46.4128	47.6191	48.9415	50.9966	53.3722	55.2937 (42a)
Hot water usage for other uses	5365	5365	23.1347	22.2095	21.5167	20.7485	20.3336	20.8319	21.3744	22.1964	23.1406	23.9117 (42b)
Average daily hot water use (litres/day)	33.7398	32.5129	31.2860	30.0591	28.8322	27.6053	27.6053	28.8322	30.0591	31.2860	32.5129	33.7398 (42c)
												104.0927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	113.2390	110.8216	107.8774	103.3996	99.7637	95.8546	94.3517	97.2832	100.3750	104.4789	109.0257	112.9452 (44)
Energy content (annual)	179.3429	157.8085	165.8036	141.5489	134.3011	117.8644	114.1102	120.4570	123.7724	141.7769	155.3272	176.8449 (45)
Distribution loss (46)m = 0.15 x (45)m	26.9014	23.6713	24.8705	21.2323	20.1452	17.6797	17.1165	18.0685	18.5659	21.2665	23.2991	26.5267 (46)
Water storage loss:												210.0000 (47)
Store volume												1.7016 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.9188 (55)
Enter (49) or (54) in (55)												
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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	231.0895	204.5474	217.5502	191.6263	186.0476	167.9417	165.8568	172.2035	173.8498	193.5235	205.4045	228.5915 (62)
WWHRS	-25.3752	-22.4420	-23.5000	-19.4589	-18.1350	-15.5183	-14.5459	-15.4681	-16.0558	-18.9280	-21.4432	-24.9053 (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	205.7143	182.1053	194.0502	172.1673	167.9126	152.4235	151.3109	156.7354	157.7940	174.5955	183.9613	203.6862 (64)
Total per year (kWh/year)												2102.4566 (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	101.0288	89.8624	96.5270	87.1269	86.0524	79.2518	79.3389	81.4492	81.2162	88.5381	91.7082	100.1982 (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	93.3005	93.3005	93.3005	93.3005	93.3005	93.3005	93.3005	93.3005	93.3005	93.3005	93.3005	93.3005 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.2024	91.0098	82.2024	84.9424	82.2024	84.9424	82.2024	82.2024	84.9424	82.2024	84.9424	82.2024 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.7073	164.3957	160.1410	151.0833	139.6495	128.9034	121.7243	120.0359	124.2906	133.3483	144.7821	155.5282 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3301	32.3301	32.3301	32.3301	32.3301	32.3301	32.3301	32.3301	32.3301	32.3301	32.3301	32.3301 (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)	-74.6404	-74.6404	-74.6404	-74.6404	-74.6404	-74.6404	-74.6404	-74.6404	-74.6404	-74.6404	-74.6404	-74.6404 (71)
Water heating gains (Table 5)	135.7914	133.7238	129.7405	121.0096	115.6618	110.0719	106.6383	109.4747	112.8003	119.0028	127.3724	134.6750 (72)
Total internal gains	434.6912	443.1195	426.0741	411.0255	391.5038	374.9079	361.5551	362.7032	373.0235	388.5437	411.0871	426.3958 (73)

6. Solar gains												
[Jan]				Area	Solar flux							Gains
				m2	Table 6a	Specific data	g	Specific data	FF	Access		W
					W/m2	or Table 6b		or Table 6c		factor		
Northeast				7.1300	11.2829	0.6300		0.7000		0.7700		24.5858 (75)
Southeast				2.9100	36.7938	0.6300		0.7000		0.7700		32.7220 (77)
Southwest				1.9200	36.7938	0.6300		0.7000		0.7700		21.5898 (79)
Solar gains	78.8975	142.5581	216.7456	304.9164	374.7178	386.6055	366.6542	312.3475	246.9275	163.4056	95.9882	66.5575 (83)
Total gains	513.5888	585.6775	642.8197	715.9419	766.2216	761.5134	728.2093	675.0507	619.9510	551.9493	507.0754	492.9533 (84)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

Property Reference	Flat 7				Issued on Date	14/06/2023
Assessment Reference	Flat 7	Prop Type Ref				
Property						
SAP Rating	83 B	DER	4.14	TER	11.04	
Environmental	96 A	% DER < TER			62.50	
CO ₂ Emissions (t/year)	0.33	DFEE	41.00	TFEE	31.13	
Compliance Check	See BREL	% DFEE < TFEE			-31.74	
% DPER < TPER	25.99	DPER	43.05	TPER	58.16	
Assessor Details	Mr. George Farr				Assessor ID	T355-0001

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.6600 (1b)	x 2.5000 (2b)	= 229.1500 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.6600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 229.1500 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1309 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3809 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3809 (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	0.4857	0.4761	0.4666	0.4190	0.4095	0.3619	0.3619	0.3523	0.3809	0.4095	0.4285	0.4476 (22b)
Effective ac	0.6179	0.6134	0.6089	0.5878	0.5838	0.5655	0.5655	0.5621	0.5725	0.5838	0.5918	0.6002 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
G (Uw = 1.10)			23.4900	1.0536	24.7500		(27)
EXISTING EW	26.8400	17.5700	9.2700	0.2800	2.5956	9.0000	83.4300 (29a)
PROPOSED EW	35.6200	5.9200	29.7000	0.1400	4.1580	60.0000	1782.0000 (29a)
SW	13.5500		13.5500	0.2200	2.9810	9.0000	121.9500 (29a)
PROPOSED FR	57.4400		57.4400	0.1100	6.3184	9.0000	516.9600 (30)
Total net area of external elements Aum(A, m ²)			133.4500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.8030		(33)
Party Wall			41.1400	0.0000	0.0000	45.0000	1851.3000 (32)

PF	91.6600	40.0000	3666.4000 (32d)
PC	34.2200	30.0000	1026.6000 (32b)
Internal Wall 1	132.1000	75.0000	9907.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18956.1400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 206.8093 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	40.0000	0.5000	20.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			20.0000 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	60.8030 (37)

Energy Saving Calculation Summary			ed monthly (38)m = 0.33 x (25)m x (5)													
(38)m	46.7282	46.3819	46.0424	44.4480	44.1497	42.7610	42.7610	42.5038	Sep	43.2959	Oct	44.1497	Nov	44.7532	Dec	45.3841 (38)
Heat transfer coeff	107.5312	107.1849	106.8454	105.2510	104.9527	103.5640	103.5640	103.3068	104.0989	104.9527	105.5562	106.1871	106.1871	105.2496	105.2496	(39)
Average = Sum(39)m / 12 =																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP	1.1732	1.1694	1.1657	1.1483	1.1450	1.1299	1.1299	1.1271	1.1357	1.1450	1.1516	1.1585	1.1483	1.1483	1.1483	(40)
HLP (average)																
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	31	31	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy																2.6478 (42)
Hot water usage for mixer showers	68.6141	67.5830	66.0804	63.2055	61.0839	58.7179	57.3731	58.8643	60.4989	63.0393	65.9759	68.3512	68.3512	65.9759	68.3512	(42a)
Hot water usage for baths	29.6295	29.1895	28.5698	27.4273	26.5717	25.6231	25.1107	25.7260	26.3960	27.4111	28.5772	29.5294	29.5294	28.5772	29.5294	(42b)
Hot water usage for other uses	41.7458	40.2278	38.7097	37.1917	35.6737	34.1556	34.1556	35.6737	37.1917	38.7097	40.2278	41.7458	41.7458	40.2278	41.7458	(42c)
Average daily hot water use (litres/day)																128.6819 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Energy conte	139.9894	137.0002	133.3599	127.8245	123.3293	118.4966	116.6394	120.2640	124.0866	129.1601	134.7808	139.6264	139.6264	134.7808	139.6264	(44)
Energy content (annual)	221.7090	195.0865	204.9693	174.9853	166.0249	145.7054	141.0652	148.9119	153.0112	175.2690	192.0200	218.6211	218.6211	192.0200	218.6211	(45)
Distribution loss (46)m = 0.15 x (45)m	33.2564	29.2630	30.7454	26.2478	24.9037	21.8558	21.1598	22.3368	22.9517	26.2903	28.8030	32.7932	32.7932	28.8030	32.7932	(46)
Water storage loss:																
Store volume																210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):																1.4200 (48)
Temperature factor from Table 2b																0.5400 (49)
Enter (49) or (54) in (55)																0.7668 (55)
Total storage loss	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	(56)
If cylinder contains dedicated solar storage	23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	(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	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	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	268.7422	237.5681	252.0025	220.5013	213.0581	191.2214	188.0984	195.9451	198.5272	222.3022	237.5360	265.6543	265.6543	237.5360	265.6543	(62)
WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-2.5636	-5.8893	-12.9047	-21.2554	-29.6668	-30.4357	-29.9763	-24.3741	-16.6808	-8.8402	-3.5322	-1.9784	-1.9784	-3.5322	-1.9784	(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	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	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.1786	231.6787	239.0977	199.2459	183.3913	160.7857	158.1221	171.5710	181.8464	213.4620	234.0038	263.6759	263.6759	234.0038	263.6759	(64)
12Total per year (kWh/year)																2503.0592 (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	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	111.3448	98.8515	105.7788	94.5954	92.8299	84.8599	84.5308	87.1398	87.2890	95.9035	100.2594	110.3181	110.3181	100.2594	110.3181	(65)

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

Metabolic gains (Table 5), Watts																
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	132.3883	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	122.0991	135.1811	122.0991	126.1690	122.0991	126.1690	122.0991	122.0991	126.1690	122.0991	126.1690	122.0991	126.1690	122.0991	126.1690	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	242.0988	244.6110	238.2802	224.8029	207.7901	191.8005	181.1185	178.6062	184.9370	198.4143	215.4271	231.4167	231.4167	215.4271	231.4167	(68)
Pumps, fans	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	36.2388	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	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)
Water heating gains (Table 5)	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	-105.9107	(71)
Total internal gains	149.6570	147.1005	142.1759	131.3825	124.7713	117.8609	113.6166	117.1233	121.2347	128.9026	139.2492	148.2770	148.2770	139.2492	148.2770	(72)
	576.5713	589.6091	565.2717	545.0709	517.3770	498.5469	479.5506	480.5451	495.0572	512.1325	543.5619	564.5093	564.5093	543.5619	564.5093	(73)

Solar gains	106.9317	201.5433	327.2878	491.8932	629.7940	659.9154	621.7984	513.6170	383.4542	236.6414	131.6123	89.2253 (83)
Total gains	683.5030	791.1523	892.5594	1036.9642	1147.1709	1158.4624	1101.3490	994.1621	878.5114	748.7738	675.1741	653.7346 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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Utilisation factor for gains for living area, $u_{l,m}$ (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.9681	49.1263	49.2824	50.0289	50.1711	50.8439	50.8439	50.9704	50.5826	50.1711	49.8843	49.5879
alpha	4.2645	4.2751	4.2855	4.3353	4.3447	4.3896	4.3896	4.3980	4.3722	4.3447	4.3256	4.3059
util living area	0.9899	0.9804	0.9578	0.8856	0.7420	0.5499	0.4087	0.4681	0.7241	0.9295	0.9809	0.9916 (86)
Living	19.7961	19.9665	20.2248	20.5677	20.8019	20.9033	20.9238	20.9197	20.8456	20.5266	20.1111	19.7765
Non living	18.5419	18.7599	19.0858	19.5099	19.7673	19.8706	19.8841	19.8846	19.8230	19.4744	18.9562	18.5261
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	20.3841	19.9665	20.2248	20.5677	20.8019	20.9033	20.9238	20.9197	20.8456	20.5266	20.1111	19.9477 (87)
Th 2	19.9415	19.9446	19.9476	19.9616	19.9642	19.9765	19.9765	19.9788	19.9718	19.9642	19.9589	19.9534 (88)
util rest of house	0.9871	0.9752	0.9464	0.8564	0.6855	0.4704	0.3161	0.3689	0.6452	0.9047	0.9749	0.9893 (89)
MIT 2	19.3836	18.7599	19.0858	19.5099	19.7673	19.8706	19.8841	19.8846	19.8230	19.4744	18.9562	18.7833 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	19.7340	19.1825	19.4847	19.8803	20.1296	20.2323	20.2482	20.2471	20.1811	19.8429	19.3606	0.3502 (91)
Temperature adjustment												0.0000
adjusted MIT	19.7340	19.1825	19.4847	19.8803	20.1296	20.2323	20.2482	20.2471	20.1811	19.8429	19.3606	19.1910 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9865	0.9703	0.9403	0.8538	0.6952	0.4909	0.3410	0.3955	0.6625	0.9012	0.9704	0.9871
Useful gains	674.2705	767.6895	839.3812	885.3515	797.4855	568.6930	375.5515	393.1723	582.0560	674.7740	655.1950	645.3126
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
Heat loss rate W	1659.6327	1530.8644	1387.3533	1155.6927	884.7129	583.3031	377.8246	397.4323	633.0354	970.0673	1294.1849	1591.8552
Space heating kwh	733.1095	512.8536	407.7507	194.6457	64.8972	0.0000	0.0000	0.0000	0.0000	219.6982	460.0728	704.2277
Space heating requirement - total per year (kwh/year)												3297.2553
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
Solar heating contribution - total per year (kwh/year)												0.0000
Space heating kwh	733.1095	512.8536	407.7507	194.6457	64.8972	0.0000	0.0000	0.0000	0.0000	219.6982	460.0728	704.2277
Space heating requirement after solar contribution - total per year (kwh/year)												3297.2553
Space heating per m2												
										(98c) / (4) =		

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 secondary, supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)

Fraction of space heat from main system (3)	170000 (202)
Efficiency of main space heating system 1 (in %)	237.2150 (206)

Efficiency of main space heating system 1 (in %)	237.72156 (200)
Efficiency of main space heating system 2 (in %)	0.0000 (207)

Efficiency of main space heating system, %	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

[illegible]

Water heating requirement	266.1786	231.6787	239.0977	199.2459	183.3913	160.7857	158.1221	171.5710	181.8464	213.4620	234.0038	263.6759	(64)
Efficiency of water heater (217)m	175.1981	175.1981	175.1981	175.1981	175.1981	175.1981	175.1981	175.1981	175.1981	175.1981	175.1981	175.1981	(216)
Fuel for water heating, kWh/month	151.9301	132.2381	136.4728	113.7260	104.6765	91.7737	90.2533	97.9297	103.7947	121.8403	133.5652	150.5016	(217)
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 Fans (231)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	(231)
Lighting (232)m	23.6971	19.0107	17.1170	12.5407	9.6868	7.9142	8.8366	11.4862	14.9194	19.5750	22.1100	24.3557	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-16.5877	-26.4544	-42.9441	-53.1242	-60.4741	-56.9049	-56.0352	-50.7627	-41.7841	-31.8451	-19.0798	-13.9342	(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	0.0403	-0.2522	-1.3125	-4.0174	-7.8084	-9.3080	-9.1678	-7.3291	-4.8990	-1.4104	-0.1852	0.0303	(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												1389.9860	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1981	
Water heating fuel used												1428.7021	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												191.2494	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-515.5501	(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												2494.3875	(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	1389.9860	0.1560	216.8830 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1428.7021	0.1420	202.8156 (264)
Space and water heating			419.6986 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	191.2494	0.1443	27.6032 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.9305	0.1328	-62.4011
PV Unit electricity exported	-45.6195	0.1132	-5.1622
Total			-67.5634 (269)
Total CO2, kg/year			379.7385 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1400 (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	1389.9860	1.5776	2192.8971 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1428.7021	1.5250	2178.7147 (278)
Space and water heating			4371.6119 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	191.2494	1.5338	293.3448 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.9305	1.4907	-700.5110
PV Unit electricity exported	-45.6195	0.4146	-18.9139
Total			-719.4249 (283)
Total Primary energy kWh/year			3945.5317 (286)
Dwelling Primary energy Rate (DPER)			43.0500 (287)

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

1. Overall dwelling characteristics

English		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor		91.6600 (1b)	x 2.5000 (2b)	= 229.1500 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.6600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 229.1500 (5)
Dwelling volume				

2. Ventilation rate

		m ³ 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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour	
Pressure test		30.0000 / (5) =	0.1309 (8)
Pressure Test Method		Yes	
Measured/design AP50		Blower Door	
Infiltration rate		5.0000 (17)	
Number of sides sheltered		0.3809 (18)	
		0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3809 (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												
Effective ac	0.4857	0.4761	0.4666	0.4190	0.4095	0.3619	0.3619	0.3523	0.3809	0.4095	0.4285	0.4476 (22b)
	0.6179	0.6134	0.6089	0.5878	0.5838	0.5655	0.5655	0.5621	0.5725	0.5838	0.5918	0.6002 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.20)			22.9100	1.1450	26.2328		(27)
EXISTING EW	26.8400	17.1400	9.7000	0.1800	1.7460		(29a)
PROPOSED EW	35.6200	5.7700	29.8500	0.1800	5.3730		(29a)
SW	13.5500		13.5500	0.1800	2.4390		(29a)
PROPOSED FR	57.4400		57.4400	0.1100	6.3184		(30)
Total net area of external elements Aum(A, m ²)			133.4500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.1092		(33)
Party Wall			41.1400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							210.5427 (35)
List of Thermal Bridges							
K1 Element							
E2 Other lintels (including other steel lintels)				Length 40.0000	Psi-value 0.0500	Total 2.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.0000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	44.1092 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	46.7282	46.3819	46.0424	44.4480	44.1497	42.7610	42.7610	42.5038	43.2959	44.1497	44.7532	45.3841 (38)
Average = Sum(39)m / 12 =	90.8374	90.4911	90.1516	88.5572	88.2589	86.8702	86.8702	86.6131	87.4051	88.2589	88.8624	89.4933 (39)
												88.5558
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9910	0.9872	0.9835	0.9661	0.9629	0.9477	0.9477	0.9449	0.9536	0.9629	0.9695	0.9764 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.6478 (42)

Hot water usage for mixer showers

68.6141 67.5830 66.0804 63.2055 61.0839 58.7179 57.3731 58.8643 60.4989 63.0393 65.9759 68.3512 (42a)

Hot water usage for baths

29.6295 29.1895 28.5698 27.4273 26.5717 25.6231 25.1107 25.7260 26.3960 27.4111 28.5772 29.5294 (42b)

Hot water usage for other uses

41.7458 40.2278 38.7097 37.1917 35.6737 34.1556 34.1556 35.6737 37.1917 38.7097 40.2278 41.7458 (42c)

Average daily hot water use (litres/day)

128.6819 (43)

Energy Calculation Function



Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Energy content (annual)

139.9894 137.0002 133.3599 127.8245 123.3293 118.4966 116.6394 120.2640 124.0866 129.1601 134.7808 139.6264 (44)

Energy content (annual)

221.7090 195.0865 204.9693 174.9853 166.0249 145.7054 141.0652 148.9119 153.0112 175.2690 192.0200 218.6211 (45)

Distribution loss (46)m = 0.15 x (45)m

Total = Sum(45)m = 2137.3789

Distribution loss (46)m = 0.15 x (45)m

33.2564 29.2630 30.7454 26.2478 24.9037 21.8558 21.1598 22.3368 22.9517 26.2903 28.8030 32.7932 (46)

Water storage loss:

Store volume

210.0000 (47)

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

1.7016 (48)

Temperature factor from Table 2b

0.5400 (49)

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

0.9188 (55)

Total storage loss

28.4842 25.7277 28.4842 27.5653 28.4842 27.5653 28.4842 28.4842 27.5653 28.4842 27.5653 28.4842 (56)

If cylinder contains dedicated solar storage

28.4842 25.7277 28.4842 27.5653 28.4842 27.5653 28.4842 28.4842 27.5653 28.4842 27.5653 28.4842 (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

273.4556 241.8253 256.7159 225.0626 217.7715 195.7828 192.8118 200.6585 203.0885 227.0156 242.0973 270.3677 (62)

WWHRS

-31.3675 -27.7417 -29.0495 -24.0541 -22.4176 -19.1829 -17.9809 -19.1209 -19.8473 -23.3978 -26.5069 -30.7866 (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

242.0881 214.0837 227.6664 201.0085 195.3540 176.5999 174.8309 181.5376 183.2412 203.6177 215.5904 239.5811 (64)

Total per year (kWh/year) = Sum(64)m = 2455.1995 (64)

12Total per year (kWh/year)

2455 (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

115.1155 102.2573 109.5496 98.2445 96.6006 88.5089 88.3015 90.9105 90.9381 99.6742 103.9085 114.0888 (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

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

122.1110 135.1943 122.1110 126.1814 122.1110 126.1814 122.1110 122.1110 126.1814 122.1110 126.1814 122.1110 (67)

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

242.0988 244.6110 238.2802 224.8029 207.7901 191.8005 181.1185 178.6062 184.9370 198.4143 215.4271 231.4167 (68)

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

36.2388 36.2388 36.2388 36.2388 36.2388 36.2388 36.2388 36.2388 36.2388 36.2388 36.2388 36.2388 (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)

-105.9107 -105.9107 -105.9107 -105.9107 -105.9107 -105.9107 -105.9107 -105.9107 -105.9107 -105.9107 -105.9107 -105.9107 (71)

Water heating gains (Table 5)

154.7252 152.1687 147.2440 136.4507 129.8395 122.9291 118.6848 122.1915 126.3029 133.9707 144.3174 153.3452 (72)

Total internal gains

584.6514 597.6905 573.3518 553.1514 525.4571 503.6275 484.6307 485.6252 500.1378 520.2126 551.6424 572.5894 (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

Northeast 17.1400 11.2829 0.6300 0.7000 0.7700 59.1024 (75)

Southeast 4.6500 36.7938 0.6300 0.7000 0.7700 52.2877 (77)

Northwest 1.1200 11.2829 0.6300 0.7000 0.7700 3.8620 (81)

Solar gains 115.2521 217.2312 352.7771 530.2215 678.8819 711.3567 670.2662 553.6435 413.3243 255.0650 141.8541 96.1673 (83)

Total gains 699.9035 814.9216 926.1289 1083.3729 1204.3390 1214.9842 1154.8970 1039.2687 913.4621 775.2775 693.4965 668.7567 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

tau	59.0137	59.2395	59.4626	60.5332	60.7378	61.7087	61.7087	61.8919	61.3311	60.7378	60.3253	59.9000
alpha	4.9342	4.9493	4.9642	5.0355	5.0492	5.1139	5.1139	5.1261	5.0887	5.0492	5.0217	4.9933
util living area	0.9880	0.9743	0.9396	0.8297	0.6468	0.4530	0.3302	0.3816	0.6308	0.8965	0.9751	0.9902 (86)
MIT	19.8593	20.0832	20.3951	20.7601	20.9418	20.9922	20.9987	20.9975	20.9625	20.6901	20.2239	19.8337 (87)
Th 2	20.0908	20.0940	20.0971	20.1116	20.1144	20.1271	20.1271	20.1295	20.1222	20.1144	20.1088	20.1031 (88)
util rest of house	0.9849	0.9680	0.9251	0.7959	0.5949	0.3931	0.2651	0.3103	0.5609	0.8661	0.9678	0.9877 (89)
MIT 2	18.7697	19.0538	19.4417	19.8788	20.0676	20.1226	20.1267	20.1285	20.0972	19.8142	19.2451	18.7463 (90)
Living area fraction									fLA = Living area / (4) =			0.3502 (91)
MIT	19.1512	19.4143	19.7756	20.1874	20.3738	20.4271	20.4321	20.4328	20.4002	20.1210	19.5879	19.1271 (92)
Temperature adjustment												0.0000
MIT	19.1512	19.4143	19.7756	20.1874	20.3738	20.4271	20.4321	20.4328	20.4002	20.1210	19.5879	19.1271 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9807	0.9620	0.9191	0.7990	0.6105	0.4139	0.2879	0.3353	0.5837	0.8664	0.9624	0.9840 (94)
Useful gains	686.4114	783.9754	851.2440	865.6354	735.2797	502.8333	332.4832	348.4257	533.2235	671.6986	667.4167	658.0380 (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	1349.0481	1313.4152	1196.8138	999.5846	765.5392	506.2046	332.8925	349.2935	550.6724	840.3116	1109.7008	1335.8759 (97)
Space heating kWh	493.0017	355.7835	257.1040	96.4435	22.5130	0.0000	0.0000	0.0000	0.0000	125.4481	318.4445	504.3114 (98a)
Space heating requirement - total per year (kWh/year)												2173.0497
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	493.0017	355.7835	257.1040	96.4435	22.5130	0.0000	0.0000	0.0000	0.0000	125.4481	318.4445	504.3114 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2173.0497
Space heating per m2										(98c) / (4) =		23.7077 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

[illegible]

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2354.3334	1.1300	2660.3967 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2966.1031	1.1300	3351.6965 (278)
Space and water heating			6012.0932 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	204.7687	1.5338	314.0810 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-584.5064	1.4939	-873.2092
PV Unit electricity exported	-548.1249	0.4602	-252.2511
Total			-1125.4603 (283)
Total Primary energy kWh/year			5330.8148 (286)
Target Primary Energy Rate (TPER)			58.1600 (287)

Property Reference	Flat 9		Issued on Date	14/06/2023	
Assessment Reference	Flat 9	Prop Type Ref			
Property					
SAP Rating	83 B	DER	4.07	TER	13.14
Environmental	96 A	% DER < TER	69.03		
CO ₂ Emissions (t/year)	0.35	DFEE	42.20	TFEE	43.11
Compliance Check	See BREL	% DFEE < TFEE	2.11		
% DPER < TPER	39.23	DPER	42.18	TPER	69.42
Assessor Details	Mr. George Farr			Assessor ID	T355-0001



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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	100.4500 (1b)	x 2.4500 (2b)	= 246.1025 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.4500		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 246.1025 (5)

2. Ventilation rate

	m ³ 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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1219 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3719 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3719 (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	0.4742	0.4649	0.4556	0.4091	0.3998	0.3533	0.3533	0.3440	0.3719	0.3998	0.4184	0.4370 (22b)
Effective ac	0.6124	0.6081	0.6038	0.5837	0.5799	0.5624	0.5624	0.5592	0.5692	0.5799	0.5875	0.5955 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
G (Uw = 1.10)			22.7300	1.0536	23.9492		(27)
RL			4.3700	1.0536	4.6044		(27a)
PROPOSED EW	101.6300	19.0100	82.6200	0.1400	11.5668	60.0000	4957.2000 (29a)
SW	16.7600		16.7600	0.2200	3.6872	9.0000	150.8400 (29a)
SW	21.5700		21.5700	0.2200	4.7454	0.0000	0.0000 (29a)
DW	13.5700	3.7200	9.8500	0.1400	1.3790	9.0000	88.6500 (29a)
PROPOSED FR	90.2300	4.3700	85.8600	0.1100	9.4446	9.0000	772.7400 (30)
PR	12.1300		12.1300	0.1100	1.3343	9.0000	109.1700 (30)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	129.6538	143.5453	129.6538	133.9756	129.6538	133.9756	129.6538	129.6538	133.9756	129.6538	133.9756	129.6538 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	257.0532	259.7206	252.9988	238.6890	220.6253	203.6480	192.3062	189.6387	196.3605	210.6704	228.7341	245.7113 (68)
Pumps, fans	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461 (71)
Total internal gains	151.9793	149.3628	144.3227	133.2764	126.5103	119.4379	115.0942	118.6831	122.8909	130.7384	141.3276	150.5670 (72)
	602.8411	616.7836	591.1302	570.0958	540.9442	521.2163	501.2089	502.1305	517.3818	535.2175	568.1921	590.0869 (73)

Table 9a: Calculation Summary



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	
Northeast					3.2200	11.2829	0.5700	0.7000			0.7700	10.0458 (75)	
Southeast					15.7900	36.7938	0.5700	0.7000			0.7700	160.6435 (77)	
Northwest					3.7200	11.2829	0.5700	0.7000			0.7700	11.6057 (81)	
North					4.3700	26.0000	0.5700	0.7000			1.0000	40.8009 (82)	
Solar gains	223.0960	402.4481	604.4537	829.6941	996.1947	1016.5789	968.7441	841.5166	682.6168	459.8568	271.4429	188.1137	(83)
Total gains	825.9371	1019.2316	1195.5839	1399.7899	1537.1389	1537.7953	1469.9530	1343.6470	1199.9987	995.0743	839.6350	778.2006	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.3037	49.4416	49.5774	50.2256	50.3488	50.9302	50.9302	51.0393	50.7047	50.3488	50.1003	49.8430
alpha	4.2869	4.2961	4.3052	4.3484	4.3566	4.3953	4.3953	4.4026	4.3803	4.3566	4.3400	4.3229
util living area	0.9893	0.9740	0.9385	0.8426	0.6841	0.4988	0.3656	0.4151	0.6561	0.9028	0.9776	0.9915 (86)
Living	19.8167	20.0354	20.3220	20.6461	20.8379	20.9117	20.9260	20.9235	20.8730	20.5899	20.1444	19.7844
Non living	18.5034	18.7809	19.1370	19.5259	19.7264	19.7997	19.8082	19.8094	19.7693	19.4770	18.9317	18.4708
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	20.3946	20.0354	20.3220	20.6461	20.8379	20.9117	20.9260	20.9235	20.8730	20.5899	20.1444	19.9544 (87)
Th 2	19.8675	19.8703	19.8731	19.8859	19.8883	19.8996	19.8996	19.9017	19.8952	19.8883	19.8835	19.8784 (88)
util rest of house	0.9861	0.9668	0.9217	0.8046	0.6214	0.4186	0.2756	0.3187	0.5704	0.8690	0.9701	0.9891 (89)
MIT 2	19.3237	18.7809	19.1370	19.5259	19.7264	19.7997	19.8082	19.8094	19.7693	19.4770	18.9317	18.7244 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6659	19.1817	19.5157	19.8839	20.0816	20.1550	20.1654	20.1654	20.1220	19.8326	19.3192	19.1175 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6659	19.1817	19.5157	19.8839	20.0816	20.1550	20.1654	20.1654	20.1220	19.8326	19.3192	19.1175 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9855	0.9612	0.9154	0.8045	0.6329	0.4376	0.2976	0.3422	0.5890	0.8670	0.9652	0.9869 (94)
Ext temp.	813.9245	979.6502	1094.4497	1126.1992	972.8199	672.9717	437.4207	459.7946	706.8216	862.6834	810.3821	767.9682 (95)
Heat loss rate W	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)
Space heating kWh	1954.1356	1811.1918	1646.1093	1371.2181	1043.7919	683.8923	438.9409	462.5770	744.6777	1149.7697	1529.2538	1876.5795 (97)
Space heating requirement - total per year (kWh/year)	848.3170	558.7960	410.4347	176.4136	52.8031	0.0000	0.0000	0.0000	0.0000	213.5922	517.5877	824.8068 (98a)
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)
Space heating requirement after solar contribution - total per year (kWh/year)	848.3170	558.7960	410.4347	176.4136	52.8031	0.0000	0.0000	0.0000	0.0000	213.5922	517.5877	824.8068 (98c)
Space heating per m2	(98c) / (4) =											

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 %)	237.2150 (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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1518.7704	1.5798	2399.4237 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1468.8151	1.5249	2239.7443 (278)
Space and water heating			4639.1680 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)

Energy for lighting	211.2914	1.5338	324.0858 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-474.4765	1.4905	-707.1943
PV Unit electricity exported	-45.0342	0.4152	-18.6961
Total			-725.8904 (283)
Total Primary energy kWh/year			4237.3634 (286)
Dwelling Primary energy Rate (DPER)			42.1800 (287)

Energy Saving Calculation Summary



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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	100.4500 (1b)	2.4500 (2b)	246.1025 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.4500		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 246.1025 (5)

2. Ventilation rate

	m ³ 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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1625 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4125 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4125 (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	0.5260	0.5157	0.5054	0.4538	0.4435	0.3919	0.3919	0.3816	0.4125	0.4435	0.4641	0.4847 (22b)
Effective ac	0.6383	0.6330	0.6277	0.6030	0.5983	0.5768	0.5768	0.5728	0.5851	0.5983	0.6077	0.6175 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.20)			21.0600	1.1450	24.1145		(27)
RL			4.0500	1.5918	6.4466		(27a)
PROPOSED EW	101.6300	17.6100	84.0200	0.1800	15.1236		(29a)
SW	16.7600		16.7600	0.1800	3.0168		(29a)
SW	21.5700		21.5700	0.1800	3.8826		(29a)
DW	13.5700	3.4500	10.1200	0.1800	1.8216		(29a)
PROPOSED FR	90.2300	4.0500	86.1800	0.1100	9.4798		(30)
PR	12.1300		12.1300	0.1100	1.3343		(30)
Total net area of external elements Aum(A, m ²)			255.8900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 65.2198		(33)
Party Wall			41.1400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							224.7128 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				11.4000	0.0500		0.5700
E3 Sill				11.4000	0.0500		0.5700
E4 Jamb				26.6000	0.0500		1.3300

E7 Party floor between dwellings (in blocks of flats)	63.9900	0.0700	4.4793
E11 Eaves (insulation at rafter level)	9.8500	0.0400	0.3940
E14 Flat roof	63.9900	0.0800	5.1192
E16 Corner (normal)	28.3000	0.0900	2.5470
E17 Corner (inverted - internal area greater than external area)	16.6000	-0.0900	-1.4940
R1 Head of roof window	1.9100	0.0800	0.1528
R2 Sill of roof window	1.9100	0.0600	0.1146
R3 Jamb of roof window	9.1600	0.0800	0.7328

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.5157 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 79.7355 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

Επίσης ΣΑΒ Ολοκληρωμένη Ενότητα	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	131.5766	131.1403	130.7127	128.7043	128.3286	126.5793	126.5793	126.2554	127.2531	128.3286	129.0887	129.8835 (39)
Average = Sum(39)m / 12 =												128.7025
HLP	1.3099	1.3055	1.3013	1.2813	1.2775	1.2601	1.2601	1.2569	1.2668	1.2775	1.2851	1.2930 (40)
HLP (average)												1.2813
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7437 (42)
Hot water usage for mixer showers	70.2218	69.1665	67.6287	64.6865	62.5152	60.0938	58.7174	60.2436	61.9165	64.5164	67.5218	69.9528 (42a)
Hot water usage for baths	30.3209	29.8706	29.2365	28.0673	27.1918	26.2210	25.6966	26.3263	27.0119	28.0507	29.2440	30.2184 (42b)
Hot water usage for other uses	42.7277	41.1740	39.6203	38.0665	36.5128	34.9591	34.9591	36.5128	38.0665	39.6203	41.1740	42.7277 (42c)
Average daily hot water use (litres/day)												131.6978 (43)
Daily hot water use	143.2705	140.2111	136.4855	130.8203	126.2197	121.2738	119.3731	123.0826	126.9949	132.1873	137.9398	142.8989 (44)
Energy conte	226.9054	199.6588	209.7731	179.0864	169.9160	149.1203	144.3714	152.4020	156.5975	179.3769	196.5205	223.7452 (45)
Energy content (annual)										Total = Sum(45)m =		2187.4736
Distribution loss (46)m = 0.15 x (45)m	34.0358	29.9488	31.4660	26.8630	25.4874	22.3680	21.6557	22.8603	23.4896	26.9065	29.4781	33.5618 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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	278.6520	246.3976	261.5197	229.1638	221.6626	199.1976	196.1180	204.1486	206.6748	231.1235	246.5979	275.4918 (62)
WWHRS	-32.1025	-28.3917	-29.7302	-24.6177	-22.9429	-19.6324	-18.4022	-19.5689	-20.3124	-23.9461	-27.1280	-31.5080 (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	246.5495	218.0059	231.7896	204.5460	198.7198	179.5653	177.7158	184.5797	186.3624	207.1775	219.4699	243.9838 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2498.4651 (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	116.8433	103.7776	111.1468	99.6081	97.8944	89.6444	89.4008	92.0709	92.1305	101.0401	105.4050	115.7925 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	137.1826	137.1826	137.1826	137.1826	137.1826	137.1826	137.1826	137.1826	137.1826	137.1826	137.1826	137.1826 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.6538	143.5453	129.6538	133.9756	129.6538	133.9756	129.6538	129.6538	133.9756	129.6538	133.9756	129.6538 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.0532	259.7206	252.9988	238.6890	220.6253	203.6480	192.3062	189.6387	196.3605	210.6704	228.7341	245.7113 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183	36.7183 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461	-109.7461 (71)
Water heating gains (Table 5)	157.0475	154.4310	149.3909	138.3446	131.5784	124.5061	120.1623	123.7513	127.9591	135.8066	146.3958	155.6351 (72)
Total internal gains	610.9093	624.8517	599.1984	578.1640	549.0124	526.2845	506.2771	507.1986	522.4500	543.2856	576.2602	598.1551 (73)

6. Solar gains

[Jan]	Area m2			Solar flux Table 6a W/m2		Specific data or Table 6b		Specific FF or Table 6c		Access factor Table 6d		Gains W	
Northeast	2.9800			11.2829		0.6300		0.7000		0.7700		10.2757 (75)	
Southeast	14.6300			36.7938		0.6300		0.7000		0.7700		164.5096 (77)	
Northwest	3.4500			11.2829		0.6300		0.7000		0.7700		11.8963 (81)	
Επιπλέον Calculation Ενυπόγειο	4.0500			26.0000		0.6300		0.7000		1.0000		41.7936 (82)	
Solar gains	228.4752	412.1545	619.0380	849.7200	1020.2437	1041.1215	992.1313	861.8296	699.0896	470.9495	277.9884	192.6490	(83)
Total gains	839.3845	1037.0062	1218.2363	1427.8839	1569.2560	1567.4060	1498.4083	1369.0282	1221.5396	1014.2351	854.2486	790.8041	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.6537	47.8122	47.9686	48.7172	48.8598	49.5350	49.5350	49.6621	49.2728	48.8598	48.5721	48.2749	
alpha	4.1769	4.1875	4.1979	4.2478	4.2573	4.3023	4.3023	4.3108	4.2849	4.2573	4.2381	4.2183	
util living area	0.9888	0.9734	0.9379	0.8428	0.6861	0.5018	0.3684	0.4181	0.6593	0.9023	0.9770	0.9911 (86)	
MIT	19.4627	19.7600	20.1522	20.5999	20.8678	20.9732	20.9943	20.9905	20.9176	20.5255	19.9158	19.4228 (87)	
Th 2	19.8331	19.8365	19.8398	19.8555	19.8585	19.8722	19.8722	19.8748	19.8669	19.8585	19.8525	19.8463 (88)	
util rest of house	0.9855	0.9659	0.9208	0.8043	0.6222	0.4195	0.2756	0.3188	0.5718	0.8679	0.9692	0.9885 (89)	
MIT 2	18.0780	18.4545	18.9412	19.4761	19.7559	19.8579	19.8705	19.8715	19.8154	19.4115	18.6663	18.0364 (90)	
Living area fraction	fLA = Living area / (4) =												0.3196 (91)
MIT	18.5205	18.8717	19.3282	19.8352	20.1113	20.2143	20.2296	20.2291	20.1676	19.7675	19.0656	18.4794 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.5205	18.8717	19.3282	19.8352	20.1113	20.2143	20.2296	20.2291	20.1676	19.7675	19.0656	18.4794 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9578	0.9117	0.8036	0.6371	0.4450	0.3053	0.3505	0.5964	0.8646	0.9620	0.9841	(94)
Useful gains	822.8569	993.2121	1110.6614	1147.3827	999.7673	697.5327	457.4617	479.9117	728.4659	876.9390	821.7697	778.2093	(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	1871.0790	1832.2551	1676.8057	1407.4123	1079.4057	710.6542	459.4350	483.4445	772.1235	1176.4499	1544.6222	1854.6602	(97)
Space heating kWh	779.8772	563.8368	421.2114	187.2213	59.2510	0.0000	0.0000	0.0000	0.0000	222.8361	520.4538	800.8795	(98a)
Space heating requirement - total per year (kWh/year)													3555.5671
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	779.8772	563.8368	421.2114	187.2213	59.2510	0.0000	0.0000	0.0000	0.0000	222.8361	520.4538	800.8795	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3555.5671
Space heating per m2													(98c) / (4) = 35.3964 (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	779.8772	563.8368	421.2114	187.2213	59.2510	0.0000	0.0000	0.0000	0.0000	222.8361	520.4538	800.8795	(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)	844.9374	610.8741	456.3503	202.8400	64.1939	0.0000	0.0000	0.0000	0.0000	241.4259	563.8719	867.6918	(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	246.5495	218.0059	231.7896	204.5460	198.7198	179.5653	177.7158	184.5797	186.3624	207.1775	219.4699	243.9838	(64)
Efficiency of water heater													79.8000 (216)
(217)m	86.4578	86.0926	85.3819	83.8618	81.7019	79.8000	79.8000	79.8000	79.8000	84.2235	85.9256	86.5214	(217)

Fuel for water heating, kWh/month	285.1674	253.2227	271.4739	243.9084	243.2254	225.0191	222.7015	231.3029	233.5368	245.9853	255.4186	281.9923	(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	26.9395	21.6119	19.4591	14.2566	11.0122	8.9970	10.0457	13.0578	16.9607	22.2534	25.1352	27.6882	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4171	-38.8741	-58.2892	-68.4455	-76.3215	-72.1275	-71.2157	-65.9688	-57.1738	-45.7000	-29.6060	-22.6507	(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 wind turbines (Appendix M) (negative quantity)													
(233b)m	-10.3525	-22.1755	-44.8325	-68.4686	-91.6647	-92.5435	-91.4853	-76.9661	-55.7466	-32.1155	-13.9480	-8.1593	(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												3852.1854	(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												2992.9544	(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)												217.4172	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1241.2482	(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												5907.3088	(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	3852.1854	0.2100	808.9589 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2992.9544	0.2100	628.5204 (264)
Space and water heating			1437.4794 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	217.4172	0.1443	31.3800 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-632.7901	0.1337	-84.6080
PV Unit electricity exported	-608.4582	0.1254	-76.3013
Total			-160.9093 (269)
Total CO2, kg/year			1319.8793 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.1400 (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	3852.1854	1.1300	4352.9695 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2992.9544	1.1300	3382.0385 (278)
Space and water heating			7735.0079 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.4172	1.5338	333.4818 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-632.7901	1.4941	-945.4553
PV Unit electricity exported	-608.4582	0.4603	-280.0636
Total			-1225.5189 (283)
Total Primary energy kWh/year			6973.0717 (286)
Target Primary Energy Rate (TPER)			69.4200 (287)