Full SAP Calculation Printout

Property Reference	F1	**Issued on Date**	04/10/2024
Assessment Reference	F1_Copy	**Prop Type Ref**	F1
Property	F1		

SAP Rating	83 B	**DER**	2.65	**TER**	15.78
Environmental	98 A	**% DER < TER**			83.21
CO_2 Emissions (t/year)	0.21	**DFEE**	40.63	**TFEE**	50.87
Compliance Check	See BREL	**% DFEE < TFEE**			20.12
% DPER < TPER	68.29	**DPER**	26.74	**TPER**	84.33

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		90.4500 (1b)	x	2.5000 (2b)	=	226.1250	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.4500						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	226.1250	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.0884 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3384 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2877 (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	0.3668	0.3596	0.3524	0.3164	0.3093	0.2733	0.2733	0.2661	0.2877	0.3093	0.3236	0.3380	(22b)
Effective ac	0.5673	0.5647	0.5621	0.5501	0.5478	0.5373	0.5373	0.5354	0.5414	0.5478	0.5524	0.5571	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			22.5500	1.1450	25.8206			(27)
External Wall	92.0500	22.5500	69.5000	0.1500	10.4250	9.0000	625.5000	(29a)
Communal Wall	39.6500	2.1000	37.5500	0.1500	5.6325	9.0000	337.9500	(29a)
External Roof	90.4500		90.4500	0.1000	9.0450	9.0000	814.0500	(30)
Total net area of external elements Aum(A, m2)			222.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.0231			(33)
Party Wall			18.8500	0.0000	0.0000	20.0000	377.0000	(32)
Party Floor			90.4500			40.0000	3618.0000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6672.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.7700 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		11.1075 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	64.1306 (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	42.3302	42.1353	41.9443	41.0469	40.8790	40.0974	40.0974	39.9526	40.3984	40.8790	41.2186	41.5737	(38)

Heat transfer coeff

	106.4609	106.2659	106.0749	105.1775	105.0096	104.2280	104.2280	104.0832	104.5290	105.0096	105.3492	105.7043 (39)
Average = Sum(39)m / 12 =												105.1767

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1770	1.1749	1.1727	1.1628	1.1610	1.1523	1.1523	1.1507	1.1557	1.1610	1.1647	1.1686	(40)
HLP (average)												1.1628	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6318	(42)
Hot water usage for mixer showers													
	93.9770	92.5647	90.5067	86.5691	83.6633	80.4227	78.5808	80.6232	82.8620	86.3414	90.3636	93.6169	(42a)
Hot water usage for baths													
	29.5146	29.0763	28.4590	27.3209	26.4687	25.5237	25.0133	25.6262	26.2936	27.3048	28.4663	29.4148	(42b)
Hot water usage for other uses													
	41.5826	40.0705	38.5584	37.0463	35.5342	34.0221	34.0221	35.5342	37.0463	38.5584	40.0705	41.5826	(42c)
Average daily hot water use (litres/day)												151.8107	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	165.0742	161.7115	157.5241	150.9363	145.6662	139.9685	137.6162	141.7836	146.2020	152.2046	158.9004	164.6143	(44)
Energy conte	261.4371	230.2750	242.1087	206.6243	196.0946	172.1076	166.4348	175.5577	180.2816	206.5402	226.3828	257.7463	(45)
Energy content (annual)											Total = Sum(45)m =	2521.5907	
Distribution loss (46)m = 0.15 x (45)m													
	39.2156	34.5412	36.3163	30.9936	29.4142	25.8161	24.9652	26.3337	27.0422	30.9810	33.9574	38.6619	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2200	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.7316	(55)
Total storage loss													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)
If cylinder contains dedicated solar storage													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	369.9743	328.3086	350.6459	311.6603	304.6318	246.5676	243.3768	252.4997	254.7416	315.0774	331.4188	366.2835	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	369.9743	328.3086	350.6459	311.6603	304.6318	246.5676	243.3768	252.4997	254.7416	315.0774	331.4188	366.2835	(64)
										Total per year (kWh/year) = Sum(64)m =		3675.1863	(64)
12Total per year (kWh/year)												3675	(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													
	130.8139	116.2055	124.3872	111.1730	109.0875	75.2354	73.9495	76.9829	77.9532	112.5607	117.7427	129.5867	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	121.0036	133.9683	121.0036	125.0371	121.0036	125.0371	121.0036	121.0036	125.0371	121.0036	125.0371	121.0036	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.9032	242.3926	236.1193	222.7642	205.9057	190.0611	179.4759	176.9865	183.2598	196.6149	213.4734	229.3180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	(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)													
	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	(71)
Water heating gains (Table 5)													
	175.8252	172.9248	167.1871	154.4069	146.6231	104.4936	99.3945	103.4716	108.2684	151.2913	163.5315	174.1757	(72)
Total internal gains													
	599.2094	611.7631	586.7875	564.6856	536.0098	482.0692	462.3514	463.9391	479.0427	531.3872	564.5194	586.9748	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.1200	10.6334	0.6300	0.7000	0.7700	13.3888	(74)
East	5.1100	19.6403	0.6300	0.7000	0.7700	30.6719	(76)
West	13.3200	19.6403	0.6300	0.7000	0.7700	79.9509	(80)

Solar gains	124.0115	241.9882	399.8605	589.5995	731.0652	752.7830	714.8257	607.8553	466.7623	287.2363	154.4504	102.1323	(83)
Total gains	723.2209	853.7514	986.6480	1154.2850	1267.0750	1234.8522	1177.1771	1071.7944	945.8049	818.6235	718.9698	689.1071	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.4099	17.4418	17.4732	17.6223	17.6505	17.7829	17.7829	17.8076	17.7316	17.6505	17.5936	17.5345	
alpha	2.1607	2.1628	2.1649	2.1748	2.1767	2.1855	2.1855	2.1872	2.1821	2.1767	2.1729	2.1690	
util living area													
	0.9098	0.8747	0.8183	0.7178	0.5926	0.4650	0.3577	0.4008	0.5892	0.7770	0.8788	0.9174	(86)
Living	18.0350	18.4453	19.0621	19.8173	20.3985	20.7515	20.8996	20.8682	20.5620	19.7848	18.7849	17.9618	

Non living	17.2529	17.6525	18.2493	18.9678	19.4960	19.8014	19.9109	19.8938	19.6579	18.9597	17.9978	17.1857	
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	19.4832	18.4453	19.0621	19.8173	20.3985	20.7515	20.8996	20.8682	20.5620	19.7848	18.7849	18.3868	(87)
Th 2	19.9384	19.9402	19.9419	19.9499	19.9514	19.9583	19.9583	19.9596	19.9556	19.9514	19.9483	19.9452	(88)
util rest of house	0.8994	0.8608	0.7983	0.6874	0.5490	0.4047	0.2823	0.3227	0.5293	0.7450	0.8630	0.9078	(89)
MIT 2	18.5646	17.6525	18.2493	18.9678	19.4960	19.8014	19.9109	19.8938	19.6579	18.9597	17.9978	17.5717	(90)
Living area fraction										fLA = Living area / (4) =		0.4270	(91)
MIT	18.9568	17.9910	18.5964	19.3305	19.8813	20.2071	20.3331	20.3099	20.0439	19.3120	18.3339	17.9197	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9568	17.9910	18.5964	19.3305	19.8813	20.2071	20.3331	20.3099	20.0439	19.3120	18.3339	17.9197	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8883	0.8291	0.7683	0.6674	0.5459	0.4197	0.3102	0.3500	0.5347	0.7224	0.8327	0.8846	(94)
Useful gains	642.4454	707.8868	758.0353	770.4160	691.6551	518.3003	365.2132	375.1415	505.7573	591.3481	598.6789	609.5706	(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	1560.3799	1391.1287	1283.1199	1097.0574	859.1176	584.4134	389.0891	406.9542	621.3140	914.8427	1183.4777	1450.2343	(97)
Space heating kWh	682.9432	459.1386	390.6629	235.1818	124.5921	0.0000	0.0000	0.0000	0.0000	240.6800	421.0551	625.4538	(98a)
Space heating requirement - total per year (kWh/year)												3179.7075	
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	682.9432	459.1386	390.6629	235.1818	124.5921	0.0000	0.0000	0.0000	0.0000	240.6800	421.0551	625.4538	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3179.7075	
Space heating per m2											(98c) / (4) =	35.1543	(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 %)	305.4251	(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	682.9432	459.1386	390.6629	235.1818	124.5921	0.0000	0.0000	0.0000	0.0000	240.6800	421.0551	625.4538	(98)
Space heating efficiency (main heating system 1)	305.4251	305.4251	305.4251	305.4251	305.4251	0.0000	0.0000	0.0000	0.0000	305.4251	305.4251	305.4251	(210)
Space heating fuel (main heating system)	223.6042	150.3277	127.9079	77.0015	40.7930	0.0000	0.0000	0.0000	0.0000	78.8016	137.8587	204.7814	(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	369.9743	328.3086	350.6459	311.6603	304.6318	246.5676	243.3768	252.4997	254.7416	315.0774	331.4188	366.2835	(64)
Efficiency of water heater												299.4705	(216)
(217)m	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	(217)
Fuel for water heating, kWh/month	123.5428	109.6297	117.0886	104.0704	101.7235	82.3345	81.2691	84.3154	85.0640	105.2115	110.6683	122.3104	(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	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	25.1422	20.1700	18.1608	13.3054	10.2775	8.3968	9.3755	12.1866	15.8291	20.7687	23.4582	25.8409	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.1179	-52.8512	-89.0492	-111.1134	-124.5078	-110.8931	-108.8179	-99.5326	-82.2257	-63.9533	-37.0358	-26.4705	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1041.0760	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	299.4705	
Water heating fuel used	1227.2282	(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)	202.9116	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-938.5683	(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	1532.6475	(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	1041.0760	0.1550	161.3788	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.2282	0.1414	173.5808	(264)
Space and water heating			334.9595	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	202.9116	0.1443	29.2864	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-938.5683	0.1330	-124.8101	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-124.8101	(269)
Total CO2, kg/year			239.4359	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.6500	(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	1041.0760	1.5738	1638.4878	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.2282	1.5230	1869.1153	(278)
Space and water heating			3507.6031	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	202.9116	1.5338	311.2326	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-938.5683	1.4914	-1399.7815	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1399.7815	(283)
Total Primary energy kWh/year			2419.0542	(286)
Dwelling Primary energy Rate (DPER)			26.7400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	90.4500	(1b)	x 2.5000	(2b) =	226.1250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.4500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		226.1250	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1327 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3827 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3253 (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	0.4147	0.4066	0.3985	0.3578	0.3497	0.3090	0.3090	0.3009	0.3253	0.3497	0.3659	0.3822	(22b)
Effective ac	0.5860	0.5827	0.5794	0.5640	0.5611	0.5477	0.5477	0.5453	0.5529	0.5611	0.5670	0.5730	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.5200	1.1450	23.4962			(27)
External Wall	92.0500	20.5200	71.5300	0.1800	12.8754			(29a)

Communal Wall	39.6500	2.1000	37.5500	0.1800	6.7590	(29a)
External Roof	90.4500		90.4500	0.1100	9.9495	(30)
Total net area of external elements Aum(A, m2)			222.1500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.1801	(33)
Party Wall			18.8500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.7700 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	13.8000	0.0500	0.6900
E3 Sill	9.6000	0.0500	0.4800
E4 Jamb	44.8000	0.0500	2.2400
E7 Party floor between dwellings (in blocks of flats)	46.0400	0.0700	3.2228
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.6400	0.0200	0.1328
E14 Flat roof	15.8600	0.0800	1.2688
E15 Flat roof with parapet	36.8200	0.5600	20.6192
E16 Corner (normal)	20.0000	0.0900	1.8000
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.5400	0.1200	0.9048

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 30.6084 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 85.7885 (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	43.7277	43.4786	43.2343	42.0871	41.8724	40.8732	40.8732	40.6882	41.2581	41.8724	42.3066	42.7606	(38)
Heat transfer coeff	129.5162	129.2670	129.0228	127.8756	127.6609	126.6617	126.6617	126.4767	127.0466	127.6609	128.0951	128.5491	(39)
Average = Sum(39)m / 12 =												127.8745	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4319	1.4292	1.4265	1.4138	1.4114	1.4004	1.4004	1.3983	1.4046	1.4114	1.4162	1.4212	(40)
HLP (average)												1.4138	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6318 (42)

Hot water usage for mixer showers

68.3469	67.3198	65.8231	62.9594	60.8460	58.4892	57.1497	58.6350	60.2633	62.7938	65.7190	68.0850	(42a)

Hot water usage for baths

29.5146	29.0763	28.4590	27.3209	26.4687	25.5237	25.0133	25.6262	26.2936	27.3048	28.4663	29.4148	(42b)

Hot water usage for other uses

41.5826	40.0705	38.5584	37.0463	35.5342	34.0221	34.0221	35.5342	37.0463	38.5584	40.0705	41.5826	(42c)

Average daily hot water use (litres/day) 128.1806 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.4441	136.4665	132.8405	127.3265	122.8489	118.0351	116.1850	119.7955	123.6032	128.6569	134.2558	139.0824	(44)
Energy conte	220.8453	194.3265	204.1708	174.3037	165.3782	145.1379	140.5157	148.3318	152.4151	174.5862	191.2720	217.7695	(45)
Energy content (annual)										Total = Sum(45)m =		2129.0529	
Distribution loss (46)m = 0.15 x (45)m	33.1268	29.1490	30.6256	26.1456	24.8067	21.7707	21.0774	22.2498	22.8623	26.1879	28.6908	32.6654	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	265.0955	234.2944	248.4210	217.1264	209.6284	187.9606	184.7659	192.5820	195.2379	218.8364	234.0947	262.0197	(62)
WWHRS	-31.2453	-27.6336	-28.9364	-23.9604	-22.3303	-19.1082	-17.9109	-19.0464	-19.7701	-23.3067	-26.4037	-30.6667	(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	233.8502	206.6608	219.4847	193.1660	187.2981	168.8525	166.8550	173.5356	175.4678	195.5297	207.6911	231.3529	(64)
										Total per year (kWh/year) = Sum(64)m =		2359.7443	(64)
12Total per year (kWh/year)												2360	(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	108.8312	96.5879	103.2869	92.2142	90.3884	82.5165	82.1216	84.7205	84.9362	93.4501	97.8561	107.8085	(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	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.9794	133.9414	120.9794	125.0120	120.9794	125.0120	120.9794	120.9794	125.0120	120.9794	125.0120	120.9794	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.9032	242.3926	236.1193	222.7642	205.9057	190.0611	179.4759	176.9865	183.2598	196.6149	213.4734	229.3180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	(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)	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	(71)
Water heating gains (Table 5)	146.2785	143.7320	138.8265	128.0752	121.4898	114.6063	110.3785	113.8716	117.9670	125.6049	135.9113	144.9039	(72)
Total internal gains	572.6385	585.5435	561.4027	541.3288	513.8523	492.1568	473.3112	474.3149	488.7162	508.6767	539.8742	560.6787	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.7500	10.6334	0.6300	0.7000	0.7700	12.1864	(74)
East	4.6500	19.6403	0.6300	0.7000	0.7700	27.9108	(76)
West	12.1200	19.6403	0.6300	0.7000	0.7700	72.7481	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	112.8453	220.1990	363.8564	536.5124	665.2427	685.0061	650.4658	553.1252	424.7346	261.3728	140.5433	92.9362	(83)
Total gains	685.4838	805.7425	925.2590	1077.8413	1179.0950	1177.1629	1123.7771	1027.4401	913.4508	770.0495	680.4175	653.6149	(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	14.3107	14.3383	14.3655	14.4943	14.5187	14.6332	14.6332	14.6547	14.5889	14.5187	14.4695	14.4184	
alpha	1.9540	1.9559	1.9577	1.9663	1.9679	1.9755	1.9755	1.9770	1.9726	1.9679	1.9646	1.9612	
util living area	0.9252	0.8980	0.8545	0.7735	0.6653	0.5356	0.4245	0.4685	0.6499	0.8206	0.9009	0.9311	(86)
MIT	17.3388	17.7452	18.4075	19.2788	20.0278	20.5632	20.8055	20.7562	20.3150	19.3204	18.1868	17.2699	(87)
Th 2	19.7390	19.7411	19.7431	19.7528	19.7546	19.7631	19.7631	19.7646	19.7598	19.7546	19.7509	19.7471	(88)
util rest of house	0.9153	0.8848	0.8352	0.7424	0.6168	0.4620	0.3252	0.3684	0.5819	0.7886	0.8858	0.9220	(89)
MIT 2	15.5795	16.0825	16.8994	17.9576	18.8342	19.4245	19.6548	19.6199	19.1846	18.0377	16.6447	15.4960	(90)
Living area fraction									fLA = Living area / (4) =			0.4270	(91)
MIT	16.3307	16.7924	17.5433	18.5217	19.3438	19.9107	20.1461	20.1051	19.6673	18.5854	17.3031	16.2534	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.3307	16.7924	17.5433	18.5217	19.3438	19.9107	20.1461	20.1051	19.6673	18.5854	17.3031	16.2534	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8765	0.8421	0.7912	0.7057	0.5988	0.4714	0.3577	0.3979	0.5762	0.7508	0.8446	0.8847	(94)
Useful gains	600.8399	678.5172	732.0515	760.6257	706.0355	554.9705	402.0261	408.8476	526.2991	578.1212	574.6772	578.2303	(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	1558.1700	1537.2966	1424.8404	1230.3858	975.8142	672.6637	449.1528	468.6080	707.3003	1019.4179	1306.9704	1549.4568	(97)
Space heating kWh	712.2536	577.0998	515.4350	338.2273	200.7153	0.0000	0.0000	0.0000	0.0000	328.3248	527.2511	722.5925	(98a)
Space heating requirement - total per year (kWh/year)												3921.8994	
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	712.2536	577.0998	515.4350	338.2273	200.7153	0.0000	0.0000	0.0000	0.0000	328.3248	527.2511	722.5925	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3921.8994	
Space heating per m2											(98c) / (4) =	43.3599	(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	712.2536	577.0998	515.4350	338.2273	200.7153	0.0000	0.0000	0.0000	0.0000	328.3248	527.2511	722.5925	(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)	771.6724	625.2436	558.4344	366.4435	217.4597	0.0000	0.0000	0.0000	0.0000	355.7148	571.2363	782.8738	(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	233.8502	206.6608	219.4847	193.1660	187.2981	168.8525	166.8550	173.5356	175.4678	195.5297	207.6911	231.3529	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3917	86.2355	85.9065	85.3028	84.2152	79.8000	79.8000	79.8000	79.8000	85.2129	86.0572	86.4358	(217)
Fuel for water heating, kWh/month	270.6859	239.6470	255.4926	226.4473	222.4041	211.5946	209.0915	217.4631	219.8845	229.4603	241.3407	267.6587	(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	25.1371	20.1659	18.1572	13.3027	10.2754	8.3951	9.3736	12.1841	15.8260	20.7645	23.4535	25.8358	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.9632	-25.5837	-39.3051	-47.3276	-53.8200	-51.2511	-50.6151	-46.3808	-39.4405	-30.5816	-19.2280	-14.4770	(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	-5.1095	-11.0643	-22.5988	-34.8617	-47.0218	-47.6006	-47.0541	-39.4228	-28.3456	-16.1310	-6.9174	-4.0182	(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	4249.0785	(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	2811.1703	(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)	202.8710	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-745.1196	(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	6604.0001	(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	4249.0785	0.2100	892.3065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2811.1703	0.2100	590.3458	(264)
Space and water heating			1482.6522	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	202.8710	0.1443	29.2805	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-434.9738	0.1332	-57.9412	
PV Unit electricity exported	-310.1459	0.1251	-38.8038	
Total			-96.7451	(269)
Total CO2, kg/year			1427.1170	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7800	(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	4249.0785	1.1300	4801.4586	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2811.1703	1.1300	3176.6225	(278)
Space and water heating			7978.0811	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	202.8710	1.5338	311.1703	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-434.9738	1.4922	-649.0805	
PV Unit electricity exported	-310.1459	0.4592	-142.4247	
Total			-791.5052	(283)
Total Primary energy kWh/year			7627.8470	(286)
Target Primary Energy Rate (TPER)			84.3300	(287)

Full SAP Calculation Printout

Property Reference	F2	**Issued on Date**	04/10/2024
Assessment Reference	F2_Copy	**Prop Type Ref**	F2
Property	F2		

SAP Rating	84 B	**DER**	2.49	**TER**	15.19
Environmental	98 A	**% DER < TER**			83.61
CO_2 Emissions (t/year)	0.17	**DFEE**	34.63	**TFEE**	45.08
Compliance Check	See BREL	**% DFEE < TFEE**			23.19
% DPER < TPER	68.94	**DPER**	25.25	**TPER**	81.29

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	79.5600 (1b)	x	2.5000 (2b)	=	198.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	198.9000	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1006	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3506	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2980	(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	0.3799	0.3725	0.3650	0.3278	0.3203	0.2831	0.2831	0.2756	0.2980	0.3203	0.3352	0.3501	(22b)
Effective ac	0.5722	0.5694	0.5666	0.5537	0.5513	0.5401	0.5401	0.5380	0.5444	0.5513	0.5562	0.5613	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			20.7500	1.1450	23.7595			(27)
External Wall	88.1900	22.8500	65.3400	0.1500	9.8010	9.0000	588.0600	(29a)
External Roof	79.5600		79.5600	0.1000	7.9560	9.0000	716.0400	(30)
Total net area of external elements Aum(A, m2)			167.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.6165			(33)
Party Wall			30.1000	0.0000	0.0000	20.0000	602.0000	(32)
Party Floor			79.5600			40.0000	3182.4000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5988.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		75.2702 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		8.3875 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.0040 (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	37.5553	37.3714	37.1911	36.3442	36.1858	35.4482	35.4482	35.3116	35.7323	36.1858	36.5063	36.8414	(38)
Heat transfer coeff													

	89.5593	89.3754	89.1951	88.3483	88.1898	87.4523	87.4523	87.3157	87.7364	88.1898	88.5104	88.8454 (39)
Average = Sum(39)m / 12 =												88.3475

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1257	1.1234	1.1211	1.1105	1.1085	1.0992	1.0992	1.0975	1.1028	1.1085	1.1125	1.1167	(40)
HLP (average)												1.1105	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4545 (42)
Hot water usage for mixer showers												
	89.8878	88.5369	86.5685	82.8022	80.0228	76.9233	75.1615	77.1150	79.2565	82.5845	86.4316	89.5434 (42a)
Hot water usage for baths												
	28.2357	27.8164	27.2259	26.1371	25.3218	24.4177	23.9294	24.5158	25.1543	26.1216	27.2329	28.1403 (42b)
Hot water usage for other uses												
	39.7661	38.3201	36.8740	35.4280	33.9820	32.5359	32.5359	33.9820	35.4280	36.8740	38.3201	39.7661 (42c)
Average daily hot water use (litres/day)												145.2035 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	157.8896	154.6734	150.6684	144.3673	139.3266	133.8769	131.6268	135.6128	139.8388	145.5801	151.9845	157.4498	(44)
Energy conte	250.0585	220.2528	231.5717	197.6316	187.5603	164.6173	159.1913	167.9170	172.4352	197.5509	216.5298	246.5283	(45)
Energy content (annual)										Total = Sum(45)m =		2411.8448	
Distribution loss (46)m = 0.15 x (45)m													
	37.5088	33.0379	34.7358	29.6447	28.1341	24.6926	23.8787	25.1875	25.8653	29.6326	32.4795	36.9792	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2200	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.7316	(55)
Total storage loss													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)
If cylinder contains dedicated solar storage													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	358.5957	318.2864	340.1089	302.6676	296.0975	239.0773	236.1333	244.8590	246.8952	306.0881	321.5658	355.0655	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	358.5957	318.2864	340.1089	302.6676	296.0975	239.0773	236.1333	244.8590	246.8952	306.0881	321.5658	355.0655	(64)
										Total per year (kWh/year) = Sum(64)m =		3565.4404	(64)
12Total per year (kWh/year)												3565	(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													
	127.0305	112.8731	120.8837	108.1829	106.2499	72.7449	71.5410	74.4423	75.3443	109.5717	114.4666	125.8567	(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	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.2175	122.0265	110.2175	113.8914	110.2175	113.8914	110.2175	110.2175	113.8914	110.2175	113.8914	110.2175	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	218.5185	220.7860	215.0719	202.9072	187.5515	173.1192	163.4776	161.2101	166.9242	179.0889	194.4446	208.8769	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	(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)													
	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	(71)
Water heating gains (Table 5)													
	170.7400	167.9659	162.4781	150.2540	142.8090	101.0345	96.1573	100.0569	104.6449	147.2738	158.9814	169.1623	(72)
Total internal gains													
	559.2928	570.5953	547.5843	526.8695	500.3948	447.8621	429.6693	431.3013	445.2774	496.3971	527.1343	548.0735	(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	
East	7.5100	19.6403	0.6300	0.7000	0.7700	45.0774	(76)
South	13.2400	46.7521	0.6300	0.7000	0.7700	189.1736	(78)

Solar gains	234.2511	397.9987	539.8743	657.8402	724.3698	713.0224	690.0181	641.7320	581.1601	438.8016	280.4415	200.5329	(83)
Total gains	793.5439	968.5940	1087.4586	1184.7098	1224.7647	1160.8844	1119.6874	1073.0334	1026.4374	935.1987	807.5758	748.6064	(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	18.5740	18.6122	18.6498	18.8286	18.8624	19.0215	19.0215	19.0512	18.9599	18.8624	18.7941	18.7232	
alpha	2.2383	2.2408	2.2433	2.2552	2.2575	2.2681	2.2681	2.2701	2.2640	2.2575	2.2529	2.2482	
util living area													
	0.8696	0.8137	0.7492	0.6565	0.5469	0.4296	0.3230	0.3481	0.5007	0.6862	0.8215	0.8818	(86)
Living	18.5502	19.0190	19.5416	20.1087	20.5397	20.8124	20.9290	20.9134	20.7192	20.1565	19.2667	18.4589	
Non living	17.7753	18.2251	18.7238	19.2590	19.6475	19.8832	19.9678	19.9599	19.8114	19.3186	18.4806	17.6923	
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	19.7468	19.0190	19.5416	20.1087	20.5397	20.8124	20.9290	20.9134	20.7192	20.1565	19.2667	18.8143	(87)
Th 2	19.9799	19.9818	19.9836	19.9923	19.9939	20.0015	20.0015	20.0029	19.9986	19.9939	19.9906	19.9872	(88)
util rest of house													
	0.8561	0.7959	0.7257	0.6249	0.5049	0.3738	0.2559	0.2802	0.4448	0.6501	0.8013	0.8693	(89)
MIT 2	18.8521	18.2251	18.7238	19.2590	19.6475	19.8832	19.9678	19.9599	19.8114	19.3186	18.4806	18.0134	(90)
Living area fraction										fLA = Living area / (4) =		0.4183	(91)
MIT	19.2264	18.5572	19.0659	19.6145	20.0207	20.2718	20.3699	20.3588	20.1911	19.6691	18.8095	18.3484	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2264	18.5572	19.0659	19.6145	20.0207	20.2718	20.3699	20.3588	20.1911	19.6691	18.8095	18.3484	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8449	0.7668	0.7021	0.6122	0.5060	0.3894	0.2812	0.3050	0.4560	0.6373	0.7736	0.8451	(94)
Useful gains	670.4447	742.7510	763.4564	725.2915	619.7636	451.9909	314.8810	327.3039	468.0834	596.0083	624.7112	632.6466	(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													
	1336.7957	1220.6166	1120.8150	946.6041	733.8011	496.0151	329.6834	345.6619	534.4144	799.8000	1036.4082	1257.0216	(97)
Space heating kWh													
	495.7652	321.1257	265.8748	159.3451	84.8439	0.0000	0.0000	0.0000	0.0000	151.6210	296.4218	464.5350	(98a)
Space heating requirement - total per year (kWh/year)												2239.5325	
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													
	495.7652	321.1257	265.8748	159.3451	84.8439	0.0000	0.0000	0.0000	0.0000	151.6210	296.4218	464.5350	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2239.5325	
Space heating per m2											(98c) / (4) =	28.1490	(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 %)	307.0079	(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													
	495.7652	321.1257	265.8748	159.3451	84.8439	0.0000	0.0000	0.0000	0.0000	151.6210	296.4218	464.5350	(98)
Space heating efficiency (main heating system 1)													
	307.0079	307.0079	307.0079	307.0079	307.0079	0.0000	0.0000	0.0000	0.0000	307.0079	307.0079	307.0079	(210)
Space heating fuel (main heating system)													
	161.4829	104.5985	86.6019	51.9026	27.6357	0.0000	0.0000	0.0000	0.0000	49.3867	96.5518	151.3104	(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													
	358.5957	318.2864	340.1089	302.6676	296.0975	239.0773	236.1333	244.8590	246.8952	306.0881	321.5658	355.0655	(64)
Efficiency of water heater												299.0365	(216)
(217)m	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	(217)
Fuel for water heating, kWh/month													
	119.9171	106.4373	113.7349	101.2143	99.0172	79.9492	78.9647	81.8827	82.5636	102.3581	107.5340	118.7365	(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	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	23.4300	18.7964	16.9241	12.3993	9.5776	7.8250	8.7370	11.3567	14.7512	19.3543	21.8607	24.0812	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.1540	-46.3192	-78.0948	-98.0301	-110.9771	-100.3852	-98.5159	-89.8765	-73.9105	-56.2069	-32.5065	-23.2359	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	729.4706	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	299.0365	
Water heating fuel used	1192.3096	(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)	189.0932	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-836.2126	(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	1274.6607	(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	729.4706	0.1554	113.3371	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1192.3096	0.1414	168.6368	(264)
Space and water heating			281.9739	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	189.0932	0.1443	27.2920	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-836.2126	0.1328	-111.0208	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-111.0208	(269)
Total CO2, kg/year			198.2451	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4900	(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	729.4706	1.5751	1149.0253	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1192.3096	1.5230	1815.9144	(278)
Space and water heating			2964.9397	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	189.0932	1.5338	290.0375	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-836.2126	1.4906	-1246.4558	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1246.4558	(283)
Total Primary energy kWh/year			2008.5213	(286)
Dwelling Primary energy Rate (DPER)			25.2500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	79.5600	(1b) x	2.5000	(2b) =	198.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		198.9000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1508 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4008 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3407 (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	0.4344	0.4259	0.4174	0.3748	0.3663	0.3237	0.3237	0.3152	0.3407	0.3663	0.3833	0.4003	(22b)
Effective ac	0.5944	0.5907	0.5871	0.5702	0.5671	0.5524	0.5524	0.5497	0.5580	0.5671	0.5735	0.5801	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			17.7900	1.1450	20.3702			(27)
External Wall	88.1900	19.8900	68.3000	0.1800	12.2940			(29a)
External Roof	79.5600		79.5600	0.1100	8.7516			(30)
Total net area of external elements Aum(A, m2)			167.7500					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	43.5158	(33)
Party Wall	30.1000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.2702 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	12.3900	0.0500	0.6195
E3 Sill	7.0500	0.0500	0.3525
E4 Jamb	32.4000	0.0500	1.6200
E7 Party floor between dwellings (in blocks of flats)	29.8100	0.0700	2.0867
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.4600	0.0200	0.1092
E15 Flat roof with parapet	35.2700	0.5600	19.7512
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E18 Party wall between dwellings	7.5000	0.0600	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.0400	0.1200	1.4448
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500

Thermal bridges (Sum(L x Psi) calculated using Appendix K)				27.0339	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	70.5497	(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	39.0114	38.7710	38.5352	37.4281	37.2209	36.2566	36.2566	36.0781	36.6281	37.2209	37.6400	38.0781	(38)
Heat transfer coeff	109.5612	109.3207	109.0850	107.9778	107.7707	106.8064	106.8064	106.6278	107.1778	107.7707	108.1897	108.6278	(39)
Average = Sum(39)m / 12 =												107.9768	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3771	1.3741	1.3711	1.3572	1.3546	1.3425	1.3425	1.3402	1.3471	1.3546	1.3599	1.3654	(40)
HLP (average)												1.3572	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy				2.4545	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.3729	64.3905	62.9589	60.2198	58.1984	55.9442	54.6629	56.0837	57.6411	60.0614	62.8594	65.1225	(42a)

Hot water usage for baths

28.2357	27.8164	27.2259	26.1371	25.3218	24.4177	23.9294	24.5158	25.1543	26.1216	27.2329	28.1403	(42b)

Hot water usage for other uses

39.7661	38.3201	36.8740	35.4280	33.9820	32.5359	32.5359	33.9820	35.4280	36.8740	38.3201	39.7661	(42c)

Average daily hot water use (litres/day)	122.6016	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3748	130.5270	127.0588	121.7849	117.5022	112.8979	111.1283	114.5814	118.2234	123.0571	128.4123	133.0288	(44)
Energy conte	211.2330	185.8686	195.2846	166.7174	158.1805	138.8211	134.4000	141.8758	145.7812	166.9873	182.9468	208.2910	(45)
Energy content (annual)										Total = Sum(45)m =		2036.3874	
Distribution loss (46)m = 0.15 x (45)m	31.6850	27.8803	29.2927	25.0076	23.7271	20.8232	20.1600	21.2814	21.8672	25.0481	27.4420	31.2437	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	255.4832	225.8365	239.5348	209.5401	202.4307	181.6438	178.6502	186.1259	188.6040	211.2375	225.7696	252.5412	(62)
WWHRS	-29.8858	-26.4312	-27.6772	-22.9179	-21.3586	-18.2767	-17.1315	-18.2176	-18.9098	-22.2926	-25.2548	-29.3323	(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	225.5974	199.4053	211.8576	186.6223	181.0720	163.3671	161.5187	167.9083	169.6942	188.9449	200.5148	223.2089	(64)
										Total per year (kWh/year) = Sum(64)m =		2279.7115	(64)
12Total per year (kWh/year)												2280	(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	105.6351	93.7756	100.3323	89.6917	87.9952	80.4162	80.0881	82.5738	82.7305	90.9234	95.0880	104.6569	(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	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.2116	122.0200	110.2116	113.8853	110.2116	113.8853	110.2116	110.2116	113.8853	110.2116	113.8853	110.2116	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.5185	220.7860	215.0719	202.9072	187.5515	173.1192	163.4776	161.2101	166.9242	179.0889	194.4446	208.8769	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	(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)	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	(71)
Water heating gains (Table 5)	141.9827	139.5471	134.8552	124.5719	118.2731	111.6892	107.6453	110.9863	114.9034	122.2089	132.0667	140.6679	(72)
Total internal gains	533.5297	545.1700	522.9556	504.1813	478.8530	458.5106	441.1515	442.2249	455.5298	474.3263	503.2135	522.5732	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East	6.4400	19.6403	0.6300	0.7000	0.7700	38.6549	(76)
South	11.3500	46.7521	0.6300	0.7000	0.7700	162.1692	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	200.8242	341.2087	462.8472	563.9918	621.0373	611.3114	591.5875	550.1845	498.2459	376.1915	240.4240	171.9171	(83)
Total gains	734.3538	886.3787	985.8028	1068.1730	1099.8903	1069.8220	1032.7390	992.4094	953.7758	850.5178	743.6376	694.4903	(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	15.1830	15.2164	15.2493	15.4057	15.4353	15.5747	15.5747	15.6007	15.5207	15.4353	15.3755	15.3135	
alpha	2.0122	2.0144	2.0166	2.0270	2.0290	2.0383	2.0383	2.0400	2.0347	2.0290	2.0250	2.0209	
util living area	0.8981	0.8573	0.8089	0.7343	0.6383	0.5144	0.4002	0.4270	0.5824	0.7568	0.8622	0.9071	(86)
MIT	17.7760	18.2411	18.8341	19.5504	20.1656	20.6281	20.8419	20.8135	20.4871	19.6740	18.6073	17.6927	(87)
Th 2	19.7809	19.7833	19.7856	19.7963	19.7983	19.8077	19.8077	19.8095	19.8041	19.7983	19.7942	19.7900	(88)
util rest of house	0.8856	0.8405	0.7861	0.7014	0.5901	0.4437	0.3075	0.3349	0.5153	0.7196	0.8431	0.8956	(89)
MIT 2	16.1203	16.6918	17.4191	18.2877	19.0075	19.5179	19.7188	19.6986	19.3791	18.4580	17.1621	16.0203	(90)
Living area fraction									fLA = Living area / (4) =			0.4183	(91)
MIT	16.8129	17.3399	18.0110	18.8159	19.4919	19.9823	20.1886	20.1650	19.8426	18.9666	17.7667	16.7198	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8129	17.3399	18.0110	18.8159	19.4919	19.9823	20.1886	20.1650	19.8426	18.9666	17.7667	16.7198	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8440	0.7972	0.7453	0.6704	0.5765	0.4547	0.3386	0.3639	0.5176	0.6892	0.8014	0.8552	(94)
Useful gains	619.7785	706.5893	734.7479	716.1404	634.0433	486.4865	349.6664	361.1528	493.7154	586.1917	595.9453	593.8974	(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	1370.9255	1359.9347	1255.6743	1070.6970	839.7420	574.8653	383.2839	401.4515	615.4755	901.6789	1154.0221	1360.0027	(97)
Space heating kWh	558.8534	439.0482	387.5693	255.2808	153.0398	0.0000	0.0000	0.0000	0.0000	234.7225	401.8153	569.9824	(98a)
Space heating requirement - total per year (kWh/year)												3000.3116	
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	558.8534	439.0482	387.5693	255.2808	153.0398	0.0000	0.0000	0.0000	0.0000	234.7225	401.8153	569.9824	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3000.3116	
Space heating per m2											(98c) / (4) =	37.7113	(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	558.8534	439.0482	387.5693	255.2808	153.0398	0.0000	0.0000	0.0000	0.0000	234.7225	401.8153	569.9824	(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)	605.4749	475.6751	419.9017	276.5772	165.8070	0.0000	0.0000	0.0000	0.0000	254.3039	435.3362	617.5324	(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	225.5974	199.4053	211.8576	186.6223	181.0720	163.3671	161.5187	167.9083	169.6942	188.9449	200.5148	223.2089	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0103	85.7785	85.3960	84.7628	83.6850	79.8000	79.8000	79.8000	79.8000	84.5474	85.5867	86.0684	(217)
Fuel for water heating, kWh/month	262.2912	232.4654	248.0883	220.1701	216.3734	204.7207	202.4043	210.4114	212.6493	223.4780	234.2828	259.3389	(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	22.8998	18.3711	16.5411	12.1187	9.3608	7.6479	8.5393	11.0997	14.4174	18.9164	21.3660	23.5362	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.0031	-22.6728	-34.9038	-42.1194	-47.9833	-45.7303	-45.1690	-41.3519	-35.1036	-27.1456	-17.0235	-12.7996	(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	-4.4122	-9.5628	-19.5469	-30.1745	-40.7174	-41.2199	-40.7411	-34.1211	-24.5211	-13.9428	-5.9740	-3.4689	(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												3250.6085	(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	2726.6738	(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)	184.8144	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-655.4087	(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	5592.6881	(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	3250.6085	0.2100	682.6278	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2726.6738	0.2100	572.6015	(264)
Space and water heating			1255.2293	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.8144	0.1443	26.6744	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-387.0060	0.1332	-51.5344	
PV Unit electricity exported	-268.4027	0.1251	-33.5768	
Total			-85.1113	(269)
Total CO2, kg/year			1208.7217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1900	(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	3250.6085	1.1300	3673.1876	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2726.6738	1.1300	3081.1414	(278)
Space and water heating			6754.3290	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.8144	1.5338	283.4745	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-387.0060	1.4921	-577.4370	
PV Unit electricity exported	-268.4027	0.4592	-123.2396	
Total			-700.6766	(283)
Total Primary energy kWh/year			6467.2278	(286)
Target Primary Energy Rate (TPER)			81.2900	(287)

Full SAP Calculation Printout

Property Reference	F3	**Issued on Date**	04/10/2024
Assessment Reference	F3_Copy	**Prop Type Ref**	F3
Property	F3		

SAP Rating	84 B	**DER**	2.46	**TER**	14.69
Environmental	98 A	**% DER < TER**			83.25
CO_2 Emissions (t/year)	0.17	**DFEE**	33.69	**TFEE**	43.47
Compliance Check	See BREL	**% DFEE < TFEE**			22.48
% DPER < TPER	68.31	**DPER**	24.90	**TPER**	78.58

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	82.2900	(1b)	x 2.5000	(2b) =	205.7250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.2900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		205.7250	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1458 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3958 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3365 (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	0.4290	0.4206	0.4122	0.3701	0.3617	0.3196	0.3196	0.3112	0.3365	0.3617	0.3785	0.3953	(22b)
Effective ac	0.5920	0.5884	0.5849	0.5685	0.5654	0.5511	0.5511	0.5484	0.5566	0.5654	0.5716	0.5781	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	78.2400	19.0000	59.2400	0.1500	8.8860	9.0000	533.1600	(29a)
Communal Wall	19.7000	2.1000	17.6000	0.1500	2.6400	9.0000	158.4000	(29a)
External Roof	82.2900		82.2900	0.1000	8.2290	9.0000	740.6100	(30)
Total net area of external elements Aum(A, m2)			180.2300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.6107			(33)
Party Wall			27.2000	0.0000	0.0000	20.0000	544.0000	(32)
Party Floor			82.2900			40.0000	3291.6000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6167.7700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		74.9516 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		9.0115 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.6222 (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	40.1911	39.9486	39.7108	38.5941	38.3851	37.4125	37.4125	37.2324	37.7872	38.3851	38.8078	39.2497	(38)

Heat transfer coeff

	92.8134	92.5708	92.3330	91.2163	91.0074	90.0347	90.0347	89.8546	90.4094	91.0074	91.4300	91.8719 (39)
Average = Sum(39)m / 12 =												91.2153

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1279	1.1249	1.1220	1.1085	1.1059	1.0941	1.0941	1.0919	1.0987	1.1059	1.1111	1.1164	(40)
HLP (average)												1.1085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5049 (42)

Hot water usage for mixer showers

	91.0501	89.6818	87.6879	83.8730	81.0576	77.9180	76.1334	78.1122	80.2814	83.6524	87.5493	90.7013 (42a)

Hot water usage for baths

	28.5992	28.1745	27.5764	26.4736	25.6478	24.7321	24.2375	24.8315	25.4781	26.4579	27.5835	28.5026 (42b)

Hot water usage for other uses

	40.2824	38.8176	37.3528	35.8880	34.4232	32.9584	32.9584	34.4232	35.8880	37.3528	38.8176	40.2824 (42c)

Average daily hot water use (litres/day) 147.0816 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.9318	156.6740	152.6171	146.2345	141.1286	135.6085	133.3293	137.3669	141.6475	147.4631	153.9504	159.4863	(44)
Energy conte	253.2929	223.1016	234.5668	200.1878	189.9862	166.7464	161.2502	170.0889	174.6655	200.1061	219.3305	249.7170	(45)
Energy content (annual)										Total = Sum(45)m =		2443.0400	
Distribution loss (46)m = 0.15 x (45)m													
	37.9939	33.4652	35.1850	30.0282	28.4979	25.0120	24.1875	25.5133	26.1998	30.0159	32.8996	37.4575	(46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.2200 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.7316 (55)

Total storage loss

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)

If cylinder contains dedicated solar storage

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

	361.8301	321.1352	343.1040	305.2238	298.5234	241.2064	238.1922	247.0309	249.1255	308.6433	324.3665	358.2542	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	361.8301	321.1352	343.1040	305.2238	298.5234	241.2064	238.1922	247.0309	249.1255	308.6433	324.3665	358.2542	(64)
										Total per year (kWh/year) = Sum(64)m =		3596.6356	(64)
12Total per year (kWh/year)												3597	(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

	128.1060	113.8203	121.8796	109.0328	107.0565	73.4528	72.2256	75.1645	76.0859	110.4213	115.3978	126.9170	(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	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	(66)

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

	113.0629	125.1768	113.0629	116.8317	113.0629	116.8317	113.0629	113.0629	116.8317	113.0629	116.8317	113.0629	(67)

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

	224.1599	226.4860	220.6244	208.1456	192.3934	177.5886	167.6981	165.3720	171.2337	183.7124	199.4646	214.2694	(68)

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

	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	(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)

	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	(71)

Water heating gains (Table 5)

	172.1854	169.3755	163.8166	151.4345	143.8931	102.0178	97.0775	101.0275	105.6748	148.4158	160.2747	170.5873	(72)

Total internal gains

	569.9815	581.6115	558.0771	536.9850	509.9227	457.0113	438.4116	440.0356	454.3134	505.7643	537.1442	558.4928	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	814.1895	983.7551	1076.8625	1135.7334	1146.6266	1075.8528	1040.4350	1014.6630	1000.3567	941.2285	827.0016	769.2667	(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	18.4593	18.5077	18.5553	18.7825	18.8256	19.0290	19.0290	19.0671	18.9501	18.8256	18.7386	18.6485	
alpha	2.2306	2.2338	2.2370	2.2522	2.2550	2.2686	2.2686	2.2711	2.2633	2.2550	2.2492	2.2432	
util living area													
	0.8710	0.8182	0.7623	0.6826	0.5829	0.4663	0.3532	0.3742	0.5210	0.6947	0.8234	0.8825	(86)
Living	18.5243	18.9791	19.4714	20.0250	20.4711	20.7772	20.9144	20.8994	20.6942	20.1307	19.2510	18.4425	
Non living	17.7495	18.1869	18.6589	19.1872	19.5943	19.8634	19.9645	19.9568	19.7966	19.2981	18.4669	17.6770	

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	19.7335	18.9791	19.4714	20.0250	20.4711	20.7772	20.9144	20.8994	20.6942	20.1307	19.2510	18.8002	(87)
Th 2	19.9781	19.9805	19.9829	19.9939	19.9960	20.0056	20.0056	20.0074	20.0019	19.9960	19.9918	19.9874	(88)
util rest of house	0.8576	0.8006	0.7395	0.6517	0.5405	0.4081	0.2815	0.3028	0.4645	0.6589	0.8034	0.8702	(89)
MIT 2	18.8381	18.1869	18.6589	19.1872	19.5943	19.8634	19.9645	19.9568	19.7966	19.2981	18.4669	18.0002	(90)
Living area fraction									fLA = Living area / (4) =			0.3739	(91)
MIT	19.1729	18.4831	18.9628	19.5005	19.9222	20.2051	20.3197	20.3093	20.1322	19.6094	18.7601	18.2993	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1729	18.4831	18.9628	19.5005	19.9222	20.2051	20.3197	20.3093	20.1322	19.6094	18.7601	18.2993	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8456	0.7704	0.7137	0.6352	0.5372	0.4202	0.3048	0.3252	0.4723	0.6438	0.7745	0.8453	(94)
Useful gains	688.4900	757.8801	768.5191	721.4310	616.0199	452.1231	317.1101	329.9610	472.4632	605.9520	640.5305	650.2332	(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	1380.4032	1257.4023	1150.7244	966.9362	748.2775	504.6540	334.9015	351.2691	545.3719	819.9218	1066.0844	1295.3334	(97)
Space heating kWh	514.7834	335.6789	284.3607	176.7638	98.3996	0.0000	0.0000	0.0000	0.0000	159.1935	306.3988	479.9545	(98a)
Space heating requirement - total per year (kWh/year)												2355.5334	
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	514.7834	335.6789	284.3607	176.7638	98.3996	0.0000	0.0000	0.0000	0.0000	159.1935	306.3988	479.9545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2355.5334	
Space heating per m2											(98c) / (4) =	28.6248	(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 %)	306.7578	(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	514.7834	335.6789	284.3607	176.7638	98.3996	0.0000	0.0000	0.0000	0.0000	159.1935	306.3988	479.9545	(98)
Space heating efficiency (main heating system 1)	306.7578	306.7578	306.7578	306.7578	306.7578	0.0000	0.0000	0.0000	0.0000	306.7578	306.7578	306.7578	(210)
Space heating fuel (main heating system)	167.8143	109.4280	92.6988	57.6232	32.0773	0.0000	0.0000	0.0000	0.0000	51.8955	99.8830	156.4604	(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	361.8301	321.1352	343.1040	305.2238	298.5234	241.2064	238.1922	247.0309	249.1255	308.6433	324.3665	358.2542	(64)
Efficiency of water heater												299.1059	(216)
(217)m	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	(217)
Fuel for water heating, kWh/month	120.9706	107.3651	114.7099	102.0454	99.8053	80.6425	79.6348	82.5898	83.2901	103.1886	108.4454	119.7750	(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	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	23.7460	19.0500	17.1524	12.5666	9.7068	7.9305	8.8548	11.5099	14.9502	19.6154	22.1556	24.4060	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.1072	-47.8592	-80.7025	-101.3317	-114.6217	-103.1244	-101.2001	-92.3858	-76.0631	-58.0088	-33.5822	-24.0205	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	767.8806	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	299.1059	
Water heating fuel used	1202.4624	(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)	191.6441	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-862.0073	(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	1299.9798	(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	767.8806	0.1552	119.1626	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1202.4624	0.1414	170.0743	(264)
Space and water heating			289.2369	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	191.6441	0.1443	27.6602	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-862.0073	0.1328	-114.4804	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-114.4804	(269)
Total CO2, kg/year			202.4166	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4600	(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	767.8806	1.5745	1209.0026	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1202.4624	1.5230	1831.3827	(278)
Space and water heating			3040.3853	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	191.6441	1.5338	293.9502	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-862.0073	1.4907	-1285.0372	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1285.0372	(283)
Total Primary energy kWh/year			2049.2983	(286)
Dwelling Primary energy Rate (DPER)			24.9000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	82.2900 (1b)	x	2.5000 (2b)	=	205.7250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.2900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	205.7250	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1458 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3958 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3365 (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	0.4290	0.4206	0.4122	0.3701	0.3617	0.3196	0.3196	0.3112	0.3365	0.3617	0.3785	0.3953	(22b)
Effective ac	0.5920	0.5884	0.5849	0.5685	0.5654	0.5511	0.5511	0.5484	0.5566	0.5654	0.5716	0.5781	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			18.4700	1.1450	21.1489			(27)
External Wall	78.2400	18.4700	59.7700	0.1800	10.7586			(29a)
Communal Wall	19.7000	2.1000	17.6000	0.1800	3.1680			(29a)

External Roof	82.2900	82.2900	0.1100	9.0519	(30)
Total net area of external elements Aum(A, m2)		180.2300			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	46.2274	(33)
Party Wall		27.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 74.9516 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3400	0.0500	0.5670
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	32.3700	0.0500	1.6185
E7 Party floor between dwellings (in blocks of flats)	33.7100	0.0700	2.3597
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.4600	0.0200	0.1092
E14 Flat roof	7.8800	0.0800	0.6304
E15 Flat roof with parapet	31.2900	0.5600	17.5224
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.8800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.8800	0.1200	1.3056

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.4628 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 71.6902 (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	40.1911	39.9486	39.7108	38.5941	38.3851	37.4125	37.4125	37.2324	37.7872	38.3851	38.8078	39.2497	(38)
Heat transfer coeff	111.8813	111.6387	111.4010	110.2842	110.0753	109.1027	109.1027	108.9225	109.4773	110.0753	110.4980	110.9399	(39)
Average = Sum(39)m / 12 =												110.2832	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3596	1.3566	1.3538	1.3402	1.3377	1.3258	1.3258	1.3236	1.3304	1.3377	1.3428	1.3482	(40)
HLP (average)												1.3402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5049 (42)

Hot water usage for mixer showers

66.2183	65.2231	63.7730	60.9985	58.9510	56.6676	55.3698	56.8089	58.3864	60.8381	63.6722	65.9646	(42a)

Hot water usage for baths

28.5992	28.1745	27.5764	26.4736	25.6478	24.7321	24.2375	24.8315	25.4781	26.4579	27.5835	28.5026	(42b)

Hot water usage for other uses

40.2824	38.8176	37.3528	35.8880	34.4232	32.9584	32.9584	34.4232	35.8880	37.3528	38.8176	40.2824	(42c)

Average daily hot water use (litres/day) 124.1874 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	135.1000	132.2153	128.7022	123.3601	119.0220	114.3581	112.5656	116.0635	119.7526	124.6488	130.0733	134.7496	(44)
Energy conte	213.9653	188.2728	197.8105	168.8738	160.2264	140.6166	136.1384	143.7109	147.6669	169.1473	185.3133	210.9853	(45)
Energy content (annual)										Total = Sum(45)m =		2062.7275	
Distribution loss (46)m = 0.15 x (45)m	32.0948	28.2409	29.6716	25.3311	24.0340	21.0925	20.4208	21.5566	22.1500	25.3721	27.7970	31.6478	(46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.2537 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.6770 (55)

Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	258.2155	228.2407	242.0607	211.6965	204.4766	183.4394	180.3886	187.9611	190.4897	213.3975	228.1360	255.2354	(62)
WWHRS	-30.2722	-26.7730	-28.0351	-23.2142	-21.6348	-18.5131	-17.3530	-18.4532	-19.1543	-22.5808	-25.5814	-29.7116	(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	227.9433	201.4677	214.0256	188.4823	182.8418	164.9263	163.0355	169.5078	171.3353	190.8166	202.5547	225.5238	(64)
									Total per year (kWh/year) = Sum(64)m =			2302.4608	(64)
12Total per year (kWh/year)												2302	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

106.5436	94.5750	101.1721	90.4087	88.6754	81.0132	80.6662	83.1840	83.3574	91.6416	95.8749	105.5527	(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	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.0504	125.1629	113.0504	116.8187	113.0504	116.8187	113.0504	113.0504	116.8187	113.0504	116.8187	113.0504	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.1599	226.4860	220.6244	208.1456	192.3934	177.5886	167.6981	165.3720	171.2337	183.7124	199.4646	214.2694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	(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)	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	(71)
Water heating gains (Table 5)	143.2038	140.7366	135.9841	125.5677	119.1874	112.5184	108.4223	111.8065	115.7742	123.1742	133.1595	141.8720	(72)
Total internal gains	543.9873	555.9587	533.2320	514.1052	488.2044	467.4989	449.7439	450.8020	464.3998	483.5102	513.0160	532.7649	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4000	10.6334	0.6300	0.7000	0.7700	7.7993	(74)
South	16.0700	46.7521	0.6300	0.7000	0.7700	229.6088	(78)

Solar gains	237.4081	390.9449	504.3352	582.0649	618.9568	601.5893	585.2413	558.6136	530.8319	423.3367	281.7861	204.9050	(83)
Total gains	781.3953	946.9036	1037.5672	1096.1701	1107.1612	1069.0883	1034.9852	1009.4156	995.2317	906.8469	794.8021	737.6699	(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	15.3133	15.3466	15.3793	15.5350	15.5645	15.7033	15.7033	15.7292	15.6495	15.5645	15.5050	15.4432	
alpha	2.0209	2.0231	2.0253	2.0357	2.0376	2.0469	2.0469	2.0486	2.0433	2.0376	2.0337	2.0295	
util living area	0.8923	0.8488	0.8022	0.7339	0.6442	0.5228	0.4067	0.4289	0.5757	0.7451	0.8538	0.9020	(86)
MIT	17.8529	18.3269	18.8914	19.5652	20.1586	20.6207	20.8391	20.8143	20.5041	19.7288	18.6813	17.7654	(87)
Th 2	19.7944	19.7967	19.7990	19.8095	19.8115	19.8207	19.8207	19.8224	19.8171	19.8115	19.8075	19.8033	(88)
util rest of house	0.8794	0.8315	0.7792	0.7013	0.5966	0.4524	0.3140	0.3375	0.5093	0.7074	0.8341	0.8901	(89)
MIT 2	16.2203	16.8018	17.4942	18.3132	19.0102	19.5227	19.7291	19.7111	19.4053	18.5274	17.2574	16.1153	(90)
Living area fraction									fLA = Living area / (4) =			0.3739	(91)
MIT	16.8308	17.3721	18.0166	18.7813	19.4396	19.9333	20.1442	20.1236	19.8162	18.9766	17.7898	16.7323	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8308	17.3721	18.0166	18.7813	19.4396	19.9333	20.1442	20.1236	19.8162	18.9766	17.7898	16.7323	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8361	0.7869	0.7374	0.6686	0.5800	0.4596	0.3408	0.3622	0.5092	0.6764	0.7910	0.8480	(94)
Useful gains	653.3513	745.1391	765.1322	732.9135	642.1584	491.3452	352.7029	365.6333	506.7713	613.3554	628.7162	625.5648	(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	1401.9575	1392.3667	1282.9622	1089.7536	851.9394	581.8770	386.6782	405.5834	625.7914	922.0609	1181.2024	1390.3349	(97)
Space heating kWh	556.9630	434.9370	385.2656	256.9249	156.0771	0.0000	0.0000	0.0000	0.0000	229.6769	397.7901	568.9890	(98a)
Space heating requirement - total per year (kWh/year)												2986.6235	
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	556.9630	434.9370	385.2656	256.9249	156.0771	0.0000	0.0000	0.0000	0.0000	229.6769	397.7901	568.9890	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2986.6235	
Space heating per m2											(98c) / (4) =	36.2939	(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	556.9630	434.9370	385.2656	256.9249	156.0771	0.0000	0.0000	0.0000	0.0000	229.6769	397.7901	568.9890	(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)	603.4269	471.2210	417.4058	278.3585	169.0976	0.0000	0.0000	0.0000	0.0000	248.8374	430.9751	616.4561	(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	227.9433	201.4677	214.0256	188.4823	182.8418	164.9263	163.0355	169.5078	171.3353	190.8166	202.5547	225.5238	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9838	85.7388	85.3618	84.7550	83.7069	79.8000	79.8000	79.8000	79.8000	84.4765	85.5448	86.0454	(217)
Fuel for water heating, kWh/month	265.1003	234.9784	250.7276	222.3849	218.4309	206.6746	204.3052	212.4158	214.7059	225.8812	236.7819	262.0986	(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	23.4896	18.8443	16.9672	12.4309	9.6020	7.8449	8.7592	11.3856	14.7887	19.4036	21.9164	24.1425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.4974	-23.4086	-36.0188	-43.4419	-49.4683	-47.1360	-46.5557	-42.6311	-36.2046	-28.0154	-17.5800	-13.2224	(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	-4.5841	-9.9332	-20.3004	-31.3326	-42.2761	-42.7978	-42.3022	-35.4317	-25.4660	-14.4829	-6.2066	-3.6043	(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												3235.7784	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2754.4854	(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)	189.5748	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-677.8982	(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	5587.9404	(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	3235.7784	0.2100	679.5135	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2754.4854	0.2100	578.4419	(264)
Space and water heating			1257.9554	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	189.5748	0.1443	27.3615	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-399.1803	0.1332	-53.1599	
PV Unit electricity exported	-278.7179	0.1251	-34.8682	
Total			-88.0282	(269)
Total CO2, kg/year			1209.2180	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6900	(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	3235.7784	1.1300	3656.4296	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2754.4854	1.1300	3112.5685	(278)
Space and water heating			6768.9981	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	189.5748	1.5338	290.7762	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-399.1803	1.4921	-595.6181	
PV Unit electricity exported	-278.7179	0.4592	-127.9796	
Total			-723.5977	(283)
Total Primary energy kWh/year			6466.2774	(286)
Target Primary Energy Rate (TPER)			78.5800	(287)

Full SAP Calculation Printout

Property Reference	F4	**Issued on Date**	04/10/2024
Assessment Reference	F4_Copy	**Prop Type Ref**	F4
Property	F4		

SAP Rating	85 B	**DER**	2.04	**TER**	13.00
Environmental	98 A	**% DER < TER**			84.31
CO_2 Emissions (t/year)	0.18	**DFEE**	31.55	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			23.08
% DPER < TPER	70.49	**DPER**	20.46	**TPER**	69.32

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		106.0100	(1b)	x 2.5000	(2b) =	265.0250	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.0100						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		265.0250	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1132 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3632 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3087 (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	0.3936	0.3859	0.3782	0.3396	0.3319	0.2933	0.2933	0.2856	0.3087	0.3319	0.3473	0.3627	(22b)
Effective ac	0.5775	0.5745	0.5715	0.5577	0.5551	0.5430	0.5430	0.5408	0.5477	0.5551	0.5603	0.5658	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	96.1800	19.0000	77.1800	0.1500	11.5770	9.0000	694.6200	(29a)
Communal Wall	6.5700	2.1000	4.4700	0.1500	0.6705	9.0000	40.2300	(29a)
External Roof	106.0100		106.0100	0.1000	10.6010	9.0000	954.0900	(30)
Total net area of external elements Aum(A, m2)			208.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.7042			(33)
Party Wall			28.8900	0.0000	0.0000	20.0000	577.8000	(32)
Party Floor			106.0100			40.0000	4240.4000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7407.1400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		69.8721 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		10.4380 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.1422 (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	50.5042	50.2411	49.9832	48.7720	48.5454	47.4904	47.4904	47.2951	47.8968	48.5454	49.0038	49.4831	(38)

Heat transfer coeff

	107.6464	107.3833	107.1255	105.9142	105.6876	104.6327	104.6327	104.4373	105.0390	105.6876	106.1461	106.6253 (39)
Average = Sum(39)m / 12 =												105.9131

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0154	1.0130	1.0105	0.9991	0.9970	0.9870	0.9870	0.9852	0.9908	0.9970	1.0013	1.0058	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7886	(42)
Hot water usage for mixer showers													
	97.5920	96.1254	93.9882	89.8992	86.8816	83.5164	81.6036	83.7245	86.0495	89.6628	93.8396	97.2181	(42a)
Hot water usage for baths													
	30.6452	30.1901	29.5492	28.3675	27.4826	26.5014	25.9715	26.6079	27.3008	28.3507	29.5568	30.5416	(42b)
Hot water usage for other uses													
	43.1884	41.6179	40.0474	38.4769	36.9064	35.3360	35.3360	36.9064	38.4769	40.0474	41.6179	43.1884	(42c)
Average daily hot water use (litres/day)												157.6517	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	171.4256	167.9334	163.5849	156.7436	151.2706	145.3538	142.9110	147.2389	151.8273	158.0609	165.0143	170.9481	(44)
Energy conte	271.4963	239.1349	251.4238	214.5742	203.6393	178.7294	172.8385	182.3125	187.2182	214.4871	235.0932	267.6635	(45)
Energy content (annual)										Total = Sum(45)m =		2618.6109	
Distribution loss (46)m = 0.15 x (45)m													
	40.7244	35.8702	37.7136	32.1861	30.5459	26.8094	25.9258	27.3469	28.0827	32.1731	35.2640	40.1495	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2200	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.7316	(55)
Total storage loss													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)
If cylinder contains dedicated solar storage													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	380.0335	337.1685	359.9610	319.6102	312.1765	253.1894	249.7805	259.2545	261.6782	323.0243	340.1292	376.2007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	380.0335	337.1685	359.9610	319.6102	312.1765	253.1894	249.7805	259.2545	261.6782	323.0243	340.1292	376.2007	(64)
									Total per year (kWh/year) = Sum(64)m =			3772.2065	(64)
12Total per year (kWh/year)												3772	(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													
	134.1586	119.1514	127.4845	113.8163	111.5962	77.4371	76.0787	79.2288	80.2597	115.2031	120.6389	132.8842	(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	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	136.9684	151.6436	136.9684	141.5340	136.9684	141.5340	136.9684	136.9684	141.5340	136.9684	141.5340	136.9684	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	265.6938	268.4509	261.5032	246.7123	228.0414	210.4935	198.7704	196.0133	202.9610	217.7519	236.4228	253.9707	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	(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)													
	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	(71)
Water heating gains (Table 5)													
	180.3207	177.3086	171.3501	158.0782	149.9948	107.5516	102.2563	106.4904	111.4718	154.8428	167.5540	178.6078	(72)
Total internal gains													
	647.8125	662.2326	634.6512	611.1540	579.8342	524.4086	502.8246	504.3016	520.7963	574.3926	610.3403	634.3764	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	892.0205	1064.3763	1153.4367	1209.9025	1216.5382	1143.2501	1104.8480	1078.9289	1066.8397	1009.8569	900.1977	845.1503	(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	19.1139	19.1607	19.2068	19.4265	19.4681	19.6644	19.6644	19.7012	19.5883	19.4681	19.3840	19.2969	
alpha	2.2743	2.2774	2.2805	2.2951	2.2979	2.3110	2.3110	2.3134	2.3059	2.2979	2.2923	2.2865	
util living area													
	0.8862	0.8400	0.7905	0.7163	0.6197	0.5008	0.3827	0.4045	0.5555	0.7257	0.8436	0.8964	(86)
Living	18.4908	18.9181	19.3983	19.9587	20.4248	20.7549	20.9051	20.8888	20.6673	20.0799	19.2049	18.4136	
Non living	17.7856	18.1997	18.6641	19.2037	19.6355	19.9301	20.0450	20.0357	19.8578	19.3286	18.4931	17.7162	

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	19.7164	18.9181	19.3983	19.9587	20.4248	20.7549	20.9051	20.8888	20.6673	20.0799	19.2049	18.7754	(87)
Th 2	20.0705	20.0726	20.0746	20.0841	20.0859	20.0942	20.0942	20.0957	20.0910	20.0859	20.0823	20.0785	(88)
util rest of house													
	0.8750	0.8252	0.7710	0.6891	0.5812	0.4460	0.3133	0.3357	0.5031	0.6942	0.8267	0.8861	(89)
MIT 2	18.9017	18.1997	18.6641	19.2037	19.6355	19.9301	20.0450	20.0357	19.8578	19.3286	18.4931	18.0466	(90)
Living area fraction										fLA = Living area / (4) =		0.3269	(91)
MIT	19.1679	18.4345	18.9041	19.4505	19.8935	20.1997	20.3261	20.3145	20.1224	19.5741	18.7258	18.2848	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1679	18.4345	18.9041	19.4505	19.8935	20.1997	20.3261	20.3145	20.1224	19.5741	18.7258	18.2848	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8626	0.7942	0.7427	0.6684	0.5725	0.4526	0.3316	0.3529	0.5050	0.6746	0.7968	0.8616	(94)
Useful gains	769.4577	845.3086	856.6485	808.6912	696.4312	517.4861	366.4053	380.8027	538.7557	681.2904	717.2642	728.2132	(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													
	1600.4814	1453.3771	1328.7923	1117.4464	865.9500	585.9092	389.8755	408.8229	632.5820	948.4551	1234.0291	1501.7982	(97)
Space heating kWh													
	618.2816	408.6221	351.2750	222.3037	126.1220	0.0000	0.0000	0.0000	0.0000	198.7706	372.0707	575.5473	(98a)
Space heating requirement - total per year (kWh/year)												2872.9929	
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													
	618.2816	408.6221	351.2750	222.3037	126.1220	0.0000	0.0000	0.0000	0.0000	198.7706	372.0707	575.5473	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2872.9929	
Space heating per m2											(98c) / (4) =	27.1011	(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 %)												305.2892	(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													
	618.2816	408.6221	351.2750	222.3037	126.1220	0.0000	0.0000	0.0000	0.0000	198.7706	372.0707	575.5473	(98)
Space heating efficiency (main heating system 1)													
	305.2892	305.2892	305.2892	305.2892	305.2892	0.0000	0.0000	0.0000	0.0000	305.2892	305.2892	305.2892	(210)
Space heating fuel (main heating system)													
	202.5232	133.8475	115.0630	72.8174	41.3123	0.0000	0.0000	0.0000	0.0000	65.1089	121.8748	188.5252	(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													
	380.0335	337.1685	359.9610	319.6102	312.1765	253.1894	249.7805	259.2545	261.6782	323.0243	340.1292	376.2007	(64)
Efficiency of water heater												299.5065	(216)
(217)m	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	(217)
Fuel for water heating, kWh/month													
	126.8866	112.5747	120.1847	106.7123	104.2303	84.5355	83.3973	86.5606	87.3698	107.8522	113.5632	125.6069	(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	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	28.4593	22.8311	20.5569	15.0609	11.6334	9.5046	10.6124	13.7944	17.9176	23.5089	26.5532	29.2503	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-36.9457	-60.3065	-100.8235	-125.1927	-140.0031	-124.5306	-122.2055	-112.2147	-93.3195	-72.5376	-42.4573	-30.5193	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												941.0724	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												299.5065	
Water heating fuel used												1259.4741	(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)												229.6831	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1061.0559	(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												1369.1737	(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	941.0724	0.1550	145.8852	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1259.4741	0.1414	178.1461	(264)
Space and water heating			324.0313	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	229.6831	0.1443	33.1504	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1061.0559	0.1331	-141.1925	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-141.1925	(269)
Total CO2, kg/year			215.9892	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0400	(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	941.0724	1.5739	1481.1214	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1259.4741	1.5231	1918.2432	(278)
Space and water heating			3399.3646	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	229.6831	1.5338	352.2956	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1061.0559	1.4917	-1582.8115	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1582.8115	(283)
Total Primary energy kWh/year			2168.8487	(286)
Dwelling Primary energy Rate (DPER)			20.4600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	106.0100	(1b) x	2.5000	(2b) =	265.0250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.0100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		265.0250	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1509	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4009	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3408	(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	0.4345	0.4260	0.4175	0.3749	0.3663	0.3238	0.3238	0.3152	0.3408	0.3663	0.3834	0.4004	(22b)
Effective ac	0.5944	0.5907	0.5871	0.5703	0.5671	0.5524	0.5524	0.5497	0.5581	0.5671	0.5735	0.5802	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	96.1800	19.0000	77.1800	0.1800	13.8924			(29a)
Communal Wall	6.5700	2.1000	4.4700	0.1800	0.8046			(29a)

External Roof	106.0100	106.0100	0.1100	11.6611	(30)
Total net area of external elements Aum(A, m2)		208.7600			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		50.2138	(33)
Party Wall		28.8900	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 69.8721 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.8000	0.0500	0.8900
E3 Sill	8.8500	0.0500	0.4425
E4 Jamb	51.6700	0.0500	2.5835
E7 Party floor between dwellings (in blocks of flats)	30.1800	0.0700	2.1126
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.9200	0.0200	0.2184
E14 Flat roof	2.6300	0.0800	0.2104
E15 Flat roof with parapet	38.4700	0.5600	21.5432
E16 Corner (normal)	10.0000	0.0900	0.9000
E18 Party wall between dwellings	7.5000	0.0600	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	11.5600	0.1200	1.3872

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 30.7378 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 80.9516 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	51.9850	51.6644	51.3502	49.8742	49.5981	48.3126	48.3126	48.0745	48.8077	49.5981	50.1567	50.7408	(38)
Heat transfer coeff	132.9366	132.6161	132.3018	130.8259	130.5497	129.2642	129.2642	129.0261	129.7594	130.5497	131.1084	131.6924	(39)

Average = Sum(39)m / 12 = 130.8245

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2540	1.2510	1.2480	1.2341	1.2315	1.2194	1.2194	1.2171	1.2240	1.2315	1.2368	1.2423	(40)
HLP (average)												1.2341	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7886 (42)

Hot water usage for mixer showers

70.9760	69.9094	68.3551	65.3812	63.1866	60.7392	59.3481	60.8906	62.5815	65.2093	68.2470	70.7041	(42a)

Hot water usage for baths

30.6452	30.1901	29.5492	28.3675	27.4826	26.5014	25.9715	26.6079	27.3008	28.3507	29.5568	30.5416	(42b)

Hot water usage for other uses

43.1884	41.6179	40.0474	38.4769	36.9064	35.3360	35.3360	36.9064	38.4769	40.0474	41.6179	43.1884	(42c)

Average daily hot water use (litres/day) 133.1126 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.8096	141.7174	137.9517	132.2256	127.5757	122.5766	120.6555	124.4049	128.3592	133.6074	139.4217	144.4341	(44)
Energy conte	229.3431	201.8037	212.0266	181.0103	171.7414	150.7222	145.9223	154.0393	158.2798	181.3040	198.6318	226.1489	(45)
Energy content (annual)										Total = Sum(45)m =		2210.9733	
Distribution loss (46)m = 0.15 x (45)m	34.4015	30.2706	31.8040	27.1515	25.7612	22.6083	21.8883	23.1059	23.7420	27.1956	29.7948	33.9223	(46)

Water storage loss:

Store volume	125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.2537	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.6770	(55)

Total storage loss

20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)

If cylinder contains dedicated solar storage

20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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

273.5932	241.7716	256.2768	223.8330	215.9915	193.5449	190.1725	198.2894	201.1025	225.5542	241.4545	270.3991	(62)
WWHRS -32.4473	-28.6966	-30.0495	-24.8821	-23.1893	-19.8432	-18.5999	-19.7791	-20.5306	-24.2033	-27.4194	-31.8464	(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

241.1460	213.0749	226.2273	198.9509	192.8023	173.7017	171.5727	178.5104	180.5720	201.3509	214.0352	238.5527	(64)
									Total per year (kWh/year) = Sum(64)m =		2430.4969	(64)

12Total per year (kWh/year) 2430 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.6567	99.0740	105.8990	94.4441	92.5041	84.3733	83.9193	86.6182	86.8862	95.6837	100.3033	110.5946	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.9684	151.6436	136.9684	141.5340	136.9684	141.5340	136.9684	136.9684	141.5340	136.9684	141.5340	136.9684	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.6938	268.4509	261.5032	246.7123	228.0414	210.4935	198.7704	196.0133	202.9610	217.7519	236.4228	253.9707	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	(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)	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	(71)
Water heating gains (Table 5)	150.0762	147.4316	142.3374	131.1724	124.3335	117.1852	112.7948	116.4223	120.6753	128.6072	139.3101	148.6487	(72)
Total internal gains	620.5680	635.3556	608.6384	587.2482	557.1729	534.0422	513.3631	514.2335	529.9999	551.1570	585.0964	607.4174	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	864.7760	1037.4993	1127.4239	1185.9967	1193.8768	1152.8837	1115.3865	1088.8608	1076.0432	986.6212	874.9538	818.1912	(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	15.4776	15.5150	15.5519	15.7273	15.7606	15.9173	15.9173	15.9467	15.8566	15.7606	15.6934	15.6238	
alpha	2.0318	2.0343	2.0368	2.0485	2.0507	2.0612	2.0612	2.0631	2.0571	2.0507	2.0462	2.0416	
util living area	0.9046	0.8667	0.8256	0.7628	0.6778	0.5573	0.4385	0.4611	0.6094	0.7718	0.8703	0.9131	(86)
MIT	17.7651	18.2156	18.7726	19.4613	20.0806	20.5782	20.8181	20.7910	20.4542	19.6460	18.5958	17.6869	(87)
Th 2	19.8770	19.8794	19.8818	19.8928	19.8949	19.9045	19.9045	19.9063	19.9008	19.8949	19.8907	19.8863	(88)
util rest of house	0.8937	0.8519	0.8058	0.7342	0.6347	0.4910	0.3485	0.3729	0.5479	0.7388	0.8535	0.9030	(89)
MIT 2	16.1626	16.7195	17.4083	18.2540	18.9925	19.5568	19.7926	19.7715	19.4274	18.4937	17.2074	16.0684	(90)
Living area fraction									fLA = Living area / (4) =			0.3269	(91)
MIT	16.6864	17.2085	17.8542	18.6486	19.3481	19.8907	20.1278	20.1047	19.7630	18.8704	17.6612	16.5974	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.6864	17.2085	17.8542	18.6486	19.3481	19.8907	20.1278	20.1047	19.7630	18.8704	17.6612	16.5974	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8505	0.8060	0.7610	0.6960	0.6106	0.4901	0.3679	0.3900	0.5394	0.7020	0.8089	0.8613	(94)
Useful gains	735.4695	836.2436	857.9137	825.5105	728.9702	565.0430	410.4055	424.6585	580.3754	692.5944	707.7532	704.7090	(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	1646.6052	1632.3075	1502.1833	1275.3728	998.4623	683.8923	456.0192	478.0068	734.8323	1079.6935	1384.6634	1632.6490	(97)
Space heating kWh	677.8850	534.9549	479.3365	323.9008	200.5021	0.0000	0.0000	0.0000	0.0000	288.0017	487.3753	690.3874	(98a)
Space heating requirement - total per year (kWh/year)												3682.3439	
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	677.8850	534.9549	479.3365	323.9008	200.5021	0.0000	0.0000	0.0000	0.0000	288.0017	487.3753	690.3874	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3682.3439	
Space heating per m2											(98c) / (4) =	34.7358	(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	677.8850	534.9549	479.3365	323.9008	200.5021	0.0000	0.0000	0.0000	0.0000	288.0017	487.3753	690.3874	(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)	734.4366	579.5828	519.3245	350.9218	217.2288	0.0000	0.0000	0.0000	0.0000	312.0278	528.0339	747.9820	(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	241.1460	213.0749	226.2273	198.9509	192.8023	173.7017	171.5727	178.5104	180.5720	201.3509	214.0352	238.5527	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2477	86.0360	85.7009	85.1460	84.1477	79.8000	79.8000	79.8000	79.8000	84.8619	85.8456	86.3005	(217)
Fuel for water heating, kWh/month	279.5971	247.6578	263.9731	233.6586	229.1236	217.6713	215.0033	223.6972	226.2807	237.2689	249.3257	276.4209	(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	28.4593	22.8311	20.5569	15.0609	11.6334	9.5046	10.6124	13.7944	17.9176	23.5089	26.5532	29.2503	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.7148	-29.6413	-45.3953	-54.4772	-61.7796	-58.7598	-58.0236	-53.2497	-45.4031	-35.3499	-22.3134	-16.8349	(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	-6.1551	-13.3112	-27.1578	-41.8511	-56.4100	-57.0973	-56.4476	-47.3146	-34.0441	-19.3986	-8.3297	-4.8421	(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												3989.5383	(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	2899.6782	(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)	229.6831	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-873.3017	(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	6331.5980	(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	3989.5383	0.2100	837.8030	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2899.6782	0.2100	608.9324	(264)
Space and water heating			1446.7355	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	229.6831	0.1443	33.1504	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-500.9426	0.1333	-66.7627	
PV Unit electricity exported	-372.3591	0.1251	-46.5975	
Total			-113.3601	(269)
Total CO2, kg/year			1378.4550	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0000	(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	3989.5383	1.1300	4508.1783	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2899.6782	1.1300	3276.6364	(278)
Space and water heating			7784.8147	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	229.6831	1.5338	352.2956	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-500.9426	1.4925	-747.6487	
PV Unit electricity exported	-372.3591	0.4593	-171.0307	
Total			-918.6794	(283)
Total Primary energy kWh/year			7348.5317	(286)
Target Primary Energy Rate (TPER)			69.3200	(287)

Full SAP Calculation Printout

Property Reference	F5	**Issued on Date**	04/10/2024
Assessment Reference	F5_Copy	**Prop Type Ref**	F5
Property	F5		

SAP Rating	84 B	**DER**	2.41	**TER**	14.12
Environmental	98 A	**% DER < TER**			82.93
CO_2 Emissions (t/year)	0.19	**DFEE**	35.15	**TFEE**	43.03
Compliance Check	See BREL	**% DFEE < TFEE**			18.30
% DPER < TPER	67.79	**DPER**	24.29	**TPER**	75.41

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	89.8800	(1b)	x 2.5000	(2b) =	224.7000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.8800					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		224.7000	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1335 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3835 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3260 (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	0.4156	0.4075	0.3993	0.3586	0.3504	0.3097	0.3097	0.3015	0.3260	0.3504	0.3667	0.3830	(22b)
Effective ac	0.5864	0.5830	0.5797	0.5643	0.5614	0.5480	0.5480	0.5455	0.5531	0.5614	0.5672	0.5734	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			21.2600	1.1450	24.3435			(27)
External Wall	65.6400	21.2600	44.3800	0.1500	6.6570	9.0000	399.4200	(29a)
Communal Wall	38.0600	2.1000	35.9600	0.1500	5.3940	9.0000	323.6400	(29a)
External Roof	89.8800		89.8800	0.1000	8.9880	9.0000	808.9200	(30)
Total net area of external elements Aum(A, m2)			193.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.4825			(33)
Party Wall			28.5400	0.0000	0.0000	20.0000	570.8000	(32)
Party Floor			89.8800			40.0000	3595.2000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6597.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.4088 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		9.6790 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.1615 (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	43.4802	43.2315	42.9878	41.8427	41.6285	40.6312	40.6312	40.4465	41.0154	41.6285	42.0619	42.5150	(38)

Heat transfer coeff

	100.6418	100.3930	100.1493	99.0042	98.7900	97.7927	97.7927	97.6081	98.1769	98.7900	99.2234	99.6765 (39)
Average = Sum(39)m / 12 =												99.0032

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1197	1.1170	1.1143	1.1015	1.0991	1.0880	1.0880	1.0860	1.0923	1.0991	1.1040	1.1090	(40)
HLP (average)												1.1015	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6241 (42)

Hot water usage for mixer showers

	93.7982	92.3886	90.3345	86.4044	83.5041	80.2697	78.4313	80.4698	82.7044	86.1772	90.1917	93.4388 (42a)

Hot water usage for baths

	29.4587	29.0212	28.4051	27.2691	26.4185	25.4754	24.9659	25.5777	26.2438	27.2530	28.4124	29.3591 (42b)

Hot water usage for other uses

	41.5031	39.9939	38.4847	36.9755	35.4663	33.9571	33.9571	35.4663	36.9755	38.4847	39.9939	41.5031 (42c)

Average daily hot water use (litres/day) 151.5218 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	164.7600	161.4037	157.2243	150.6491	145.3890	139.7022	137.3543	141.5138	145.9237	151.9149	158.5980	164.3011	(44)
Energy conte	260.9396	229.8367	241.6480	206.2311	195.7215	171.7801	166.1181	175.2236	179.9386	206.1471	225.9519	257.2558	(45)
Energy content (annual)										Total = Sum(45)m =		2516.7921	
Distribution loss (46)m = 0.15 x (45)m													
	39.1409	34.4755	36.2472	30.9347	29.3582	25.7670	24.9177	26.2835	26.9908	30.9221	33.8928	38.5884	(46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.2200 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.7316 (55)

Total storage loss

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)

If cylinder contains dedicated solar storage

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

	369.4768	327.8703	350.1852	311.2671	304.2587	246.2401	243.0601	252.1656	254.3986	314.6843	330.9879	365.7930	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	369.4768	327.8703	350.1852	311.2671	304.2587	246.2401	243.0601	252.1656	254.3986	314.6843	330.9879	365.7930	(64)
										Total per year (kWh/year) = Sum(64)m =		3670.3877	(64)
12Total per year (kWh/year)												3670	(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

	130.6485	116.0598	124.2340	111.0422	108.9635	75.1265	73.8442	76.8718	77.8392	112.4300	117.5994	129.4236	(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	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	120.4758	133.3839	120.4758	124.4917	120.4758	124.4917	120.4758	120.4758	124.4917	120.4758	124.4917	120.4758	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	238.8568	241.3354	235.0894	221.7925	205.0076	189.2321	178.6931	176.2145	182.4605	195.7574	212.5423	228.3178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	(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)													
	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	(71)
Water heating gains (Table 5)													
	175.6028	172.7080	166.9812	154.2253	146.4563	104.3423	99.2529	103.3223	108.1100	151.1156	163.3325	173.9565	(72)
Total internal gains													
	597.2966	609.7884	584.9076	562.8706	534.3008	480.4272	460.7830	462.3737	477.4232	529.7099	562.7276	585.1112	(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	
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)
Southwest	13.0100	36.7938	0.6300	0.7000	0.7700	146.2932	(79)
Northwest	4.9500	11.2829	0.6300	0.7000	0.7700	17.0687	(81)

Solar gains	210.5124	361.1556	501.9169	636.4358	727.2265	728.5795	699.6552	630.7166	548.2113	401.1587	252.5918	179.8780	(83)
Total gains	807.8089	970.9440	1086.8245	1199.3064	1261.5273	1209.0067	1160.4382	1093.0903	1025.6346	930.8686	815.3194	764.9892	(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	18.2109	18.2560	18.3004	18.5121	18.5522	18.7414	18.7414	18.7769	18.6681	18.5522	18.4712	18.3872	
alpha	2.2141	2.2171	2.2200	2.2341	2.2368	2.2494	2.2494	2.2518	2.2445	2.2368	2.2314	2.2258	
util living area													
	0.8867	0.8399	0.7821	0.6904	0.5765	0.4533	0.3447	0.3762	0.5410	0.7244	0.8452	0.8968	(86)
Living	18.3622	18.8073	19.3492	19.9805	20.4719	20.7843	20.9161	20.8952	20.6609	20.0259	19.1000	18.2842	

Non living	17.5999	18.0303	18.5517	19.1528	19.5997	19.8727	19.9700	19.9591	19.7770	19.2119	18.3306	17.5301	
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	19.6506	18.8073	19.3492	19.9805	20.4719	20.7843	20.9161	20.8952	20.6609	20.0259	19.1000	18.6641	(87)
Th 2	19.9847	19.9870	19.9892	19.9996	20.0015	20.0106	20.0106	20.0123	20.0071	20.0015	19.9976	19.9935	(88)
util rest of house	0.8747	0.8240	0.7605	0.6601	0.5346	0.3965	0.2748	0.3050	0.4844	0.6903	0.8270	0.8857	(89)
MIT 2	18.7648	18.0303	18.5517	19.1528	19.5997	19.8727	19.9700	19.9591	19.7770	19.2119	18.3306	17.8746	(90)
Living area fraction										fLA = Living area / (4) =		0.3858	(91)
MIT	19.1066	18.3301	18.8594	19.4722	19.9363	20.2244	20.3351	20.3203	20.1181	19.5260	18.6275	18.1792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1066	18.3301	18.8594	19.4722	19.9363	20.2244	20.3351	20.3203	20.1181	19.5260	18.6275	18.1792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8628	0.7928	0.7330	0.6426	0.5317	0.4092	0.2984	0.3279	0.4910	0.6721	0.7971	0.8612	(94)
Useful gains	696.9730	769.7497	796.5993	770.7204	670.7939	494.7706	346.2317	358.4573	503.6343	625.6782	649.9204	658.8281	(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	1490.1586	1348.2881	1237.7887	1046.6908	813.6595	550.0289	365.2631	382.6530	590.8343	881.8001	1143.7960	1393.4018	(97)
Space heating kWh	590.1300	388.7778	328.2449	198.6987	106.2920	0.0000	0.0000	0.0000	0.0000	190.5547	355.5905	546.5229	(98a)
Space heating requirement - total per year (kWh/year)												2704.8115	
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	590.1300	388.7778	328.2449	198.6987	106.2920	0.0000	0.0000	0.0000	0.0000	190.5547	355.5905	546.5229	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2704.8115	
Space heating per m2											(98c) / (4) =	30.0936	(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 %)												306.1532	(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	590.1300	388.7778	328.2449	198.6987	106.2920	0.0000	0.0000	0.0000	0.0000	190.5547	355.5905	546.5229	(98)
Space heating efficiency (main heating system 1)	306.1532	306.1532	306.1532	306.1532	306.1532	0.0000	0.0000	0.0000	0.0000	306.1532	306.1532	306.1532	(210)
Space heating fuel (main heating system)	192.7564	126.9880	107.2159	64.9017	34.7186	0.0000	0.0000	0.0000	0.0000	62.2416	116.1479	178.5129	(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	369.4768	327.8703	350.1852	311.2671	304.2587	246.2401	243.0601	252.1656	254.3986	314.6843	330.9879	365.7930	(64)
Efficiency of water heater												299.2742	(216)
(217)m	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	(217)
Fuel for water heating, kWh/month	123.4576	109.5552	117.0115	104.0073	101.6655	82.2791	81.2165	84.2591	85.0052	105.1492	110.5969	122.2267	(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	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	25.0325	20.0820	18.0816	13.2474	10.2326	8.3602	9.3346	12.1334	15.7601	20.6781	23.3559	25.7282	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-31.7431	-52.1161	-87.6541	-109.4638	-123.0729	-110.3885	-108.3229	-99.0669	-81.8222	-63.0085	-36.5815	-26.1900	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												883.4829	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												299.2742	
Water heating fuel used												1226.4296	(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)												202.0266	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-929.4304	(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												1382.5087	(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	883.4829	0.1552	137.1060	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1226.4296	0.1414	173.4676	(264)
Space and water heating			310.5736	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	202.0266	0.1443	29.1587	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.4304	0.1329	-123.5329	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-123.5329	(269)
Total CO2, kg/year			216.1994	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4100	(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	883.4829	1.5745	1391.0327	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1226.4296	1.5230	1867.8981	(278)
Space and water heating			3258.9308	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	202.0266	1.5338	309.8751	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.4304	1.4911	-1385.9184	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1385.9184	(283)
Total Primary energy kWh/year			2182.8875	(286)
Dwelling Primary energy Rate (DPER)			24.2900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	89.8800	(1b)	x 2.5000	(2b) =	224.7000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		224.7000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1335	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3835	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3260	(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	0.4156	0.4075	0.3993	0.3586	0.3504	0.3097	0.3097	0.3015	0.3260	0.3504	0.3667	0.3830	(22b)
Effective ac	0.5864	0.5830	0.5797	0.5643	0.5614	0.5480	0.5480	0.5455	0.5531	0.5614	0.5672	0.5734	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.3700	1.1450	23.3244			(27)
External Wall	65.6400	20.3700	45.2700	0.1800	8.1486			(29a)

Communal Wall	38.0600	2.1000	35.9600	0.1800	6.4728	(29a)
External Roof	89.8800		89.8800	0.1100	9.8868	(30)
Total net area of external elements Aum(A, m2)			193.5800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.9326	(33)
Party Wall			28.5400	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.4088 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	12.8500	0.0500	0.6425
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	35.6500	0.0500	1.7825
E7 Party floor between dwellings (in blocks of flats)	34.7700	0.0700	2.4339
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7000	0.0200	0.1340
E14 Flat roof	15.2200	0.0800	1.2176
E15 Flat roof with parapet	26.2400	0.5600	14.6944
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4200	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	11.4200	0.1200	1.3704
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.8003 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 73.7329 (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	43.4802	43.2315	42.9878	41.8427	41.6285	40.6312	40.6312	40.4465	41.0154	41.6285	42.0619	42.5150	(38)
Heat transfer coeff	117.2132	116.9645	116.7207	115.5757	115.3614	114.3642	114.3642	114.1795	114.7483	115.3614	115.7948	116.2479	(39)
Average = Sum(39)m / 12 =												115.5746	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3041	1.3013	1.2986	1.2859	1.2835	1.2724	1.2724	1.2704	1.2767	1.2835	1.2883	1.2934	(40)
HLP (average)												1.2859	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6241 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.2169	67.1917	65.6978	62.8396	60.7303	58.3780	57.0409	58.5235	60.1487	62.6743	65.5939	67.9555	(42a)
Hot water usage for baths	29.4587	29.0212	28.4051	27.2691	26.4185	25.4754	24.9659	25.5777	26.2438	27.2530	28.4124	29.3591	(42b)
Hot water usage for other uses	41.5031	39.9939	38.4847	36.9755	35.4663	33.9571	33.9571	35.4663	36.9755	38.4847	39.9939	41.5031	(42c)
Average daily hot water use (litres/day)												127.9366	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.1787	136.2068	132.5877	127.0842	122.6151	117.8104	115.9639	119.5675	123.3680	128.4121	134.0003	138.8177	(44)
Energy conte	220.4251	193.9567	203.7823	173.9720	165.0635	144.8617	140.2483	148.0495	152.1251	174.2540	190.9080	217.3550	(45)
Energy content (annual)										Total = Sum(45)m =		2125.0011	
Distribution loss (46)m = 0.15 x (45)m	33.0638	29.0935	30.5673	26.0958	24.7595	21.7293	21.0372	22.2074	22.8188	26.1381	28.6362	32.6033	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	264.6752	233.9246	248.0325	216.7947	209.3137	187.6844	184.4985	192.2997	194.9478	218.5041	233.7307	261.6052	(62)
WWHRS	-31.1859	-27.5811	-28.8813	-23.9149	-22.2878	-19.0718	-17.8768	-19.0102	-19.7324	-23.2624	-26.3534	-30.6084	(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	233.4893	206.3435	219.1512	192.8799	187.0259	168.6126	166.6217	173.2895	175.2154	195.2418	207.3773	230.9968	(64)
										Total per year (kWh/year) = Sum(64)m =		2356.2449	(64)
12Total per year (kWh/year)												2356	(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	108.6915	96.4649	103.1578	92.1039	90.2838	82.4247	82.0327	84.6266	84.8398	93.3396	97.7351	107.6707	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.4521	133.3577	120.4521	124.4672	120.4521	124.4672	120.4521	120.4521	124.4672	120.4521	124.4672	120.4521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.8568	241.3354	235.0894	221.7925	205.0076	189.2321	178.6931	176.2145	182.4605	195.7574	212.5423	228.3178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	(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)	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	(71)
Water heating gains (Table 5)	146.0907	143.5490	138.6529	127.9221	121.3491	114.4788	110.2590	113.7454	117.8330	125.4564	135.7432	144.7187	(72)
Total internal gains	570.7607	583.6032	559.5556	539.5429	512.1700	490.5392	471.7654	472.7732	487.1218	507.0270	538.1138	558.8497	(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	
South	3.1600	46.7521	0.6300	0.7000	0.7700	45.1502	(78)
Southwest	12.4700	36.7938	0.6300	0.7000	0.7700	140.2211	(79)
Northwest	4.7400	11.2829	0.6300	0.7000	0.7700	16.3445	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	201.7158	346.0625	480.9363	609.8232	696.8087	698.1011	670.3885	604.3398	525.2927	384.3926	242.0366	172.3617	(83)
Total gains	772.4765	929.6658	1040.4919	1149.3660	1208.9787	1188.6403	1142.1538	1077.1130	1012.4145	891.4196	780.1504	731.2114	(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	15.6362	15.6695	15.7022	15.8578	15.8872	16.0258	16.0258	16.0517	15.9721	15.8872	15.8278	15.7661	
alpha	2.0424	2.0446	2.0468	2.0572	2.0591	2.0684	2.0684	2.0701	2.0648	2.0591	2.0552	2.0511	
util living area	0.9037	0.8646	0.8159	0.7362	0.6322	0.5037	0.3914	0.4241	0.5882	0.7665	0.8694	0.9122	(86)
MIT	17.8021	18.2564	18.8534	19.5875	20.2101	20.6574	20.8555	20.8240	20.4962	19.6778	18.6205	17.7209	(87)
Th 2	19.8376	19.8398	19.8419	19.8519	19.8538	19.8625	19.8625	19.8641	19.8591	19.8538	19.8500	19.8460	(88)
util rest of house	0.8922	0.8491	0.7945	0.7048	0.5859	0.4365	0.3042	0.3366	0.5240	0.7315	0.8518	0.9016	(89)
MIT 2	16.1793	16.7401	17.4751	18.3673	19.0962	19.5906	19.7784	19.7560	19.4327	18.4992	17.2081	16.0813	(90)
Living area fraction									fLA = Living area / (4) =			0.3858	(91)
MIT	16.8055	17.3252	18.0069	18.8381	19.5260	20.0022	20.1940	20.1681	19.8431	18.9539	17.7531	16.7139	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8055	17.3252	18.0069	18.8381	19.5260	20.0022	20.1940	20.1681	19.8431	18.9539	17.7531	16.7139	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8509	0.8056	0.7528	0.6727	0.5713	0.4453	0.3308	0.3613	0.5230	0.6990	0.8097	0.8617	(94)
Useful gains	657.3165	748.9239	783.3243	773.1549	690.6734	529.2833	377.8074	389.1237	529.4647	623.0762	631.7079	630.1028	(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	1465.8042	1453.3026	1343.0933	1148.6073	902.8134	617.8192	411.0250	430.2364	659.0076	963.7223	1233.5745	1454.7149	(97)
Space heating kWh	601.5149	473.3424	416.4681	270.3257	157.8321	0.0000	0.0000	0.0000	0.0000	253.4407	433.3439	613.5114	(98a)
Space heating requirement - total per year (kWh/year)												3219.7793	
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	601.5149	473.3424	416.4681	270.3257	157.8321	0.0000	0.0000	0.0000	0.0000	253.4407	433.3439	613.5114	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3219.7793	
Space heating per m2										(98c) / (4) =		35.8231	(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	601.5149	473.3424	416.4681	270.3257	157.8321	0.0000	0.0000	0.0000	0.0000	253.4407	433.3439	613.5114	(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)	651.6954	512.8304	451.2114	292.8773	170.9991	0.0000	0.0000	0.0000	0.0000	274.5836	469.4951	664.6927	(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	233.4893	206.3435	219.1512	192.8799	187.0259	168.6126	166.6217	173.2895	175.2154	195.2418	207.3773	230.9968	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0851	85.8602	85.4762	84.8168	83.6816	79.8000	79.8000	79.8000	79.8000	84.6459	85.6727	86.1426	(217)
Fuel for water heating, kWh/month	271.2307	240.3250	256.3885	227.4077	223.4969	211.2940	208.7991	217.1548	219.5681	230.6572	242.0577	268.1564	(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	25.0276	20.0780	18.0781	13.2448	10.2306	8.3585	9.3327	12.1310	15.7570	20.6740	23.3513	25.7232	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.8614	-25.4329	-39.0778	-47.0595	-53.5203	-50.9679	-50.3358	-46.1225	-39.2171	-30.4040	-19.1137	-14.3898	(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	-5.0722	-10.9841	-22.4359	-34.6119	-46.6861	-47.2609	-46.7180	-39.1404	-28.1417	-16.0142	-6.8670	-3.9889	(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	3488.3850	(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	2816.5360	(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)	201.9869	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-740.4240	(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	5852.4838	(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	3488.3850	0.2100	732.5608	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2816.5360	0.2100	591.4726	(264)
Space and water heating			1324.0334	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	201.9869	0.1443	29.1529	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.5028	0.1332	-57.6111	
PV Unit electricity exported	-307.9213	0.1251	-38.5252	
Total			-96.1362	(269)
Total CO2, kg/year			1268.9794	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1200	(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	3488.3850	1.1300	3941.8750	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2816.5360	1.1300	3182.6857	(278)
Space and water heating			7124.5607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	201.9869	1.5338	309.8142	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.5028	1.4922	-645.3893	
PV Unit electricity exported	-307.9213	0.4592	-141.4020	
Total			-786.7913	(283)
Total Primary energy kWh/year			6777.6844	(286)
Target Primary Energy Rate (TPER)			75.4100	(287)

Full SAP Calculation Printout

Property Reference	F6	**Issued on Date**	04/10/2024
Assessment Reference	F6_Copy	**Prop Type Ref**	F6
Property	F6		

SAP Rating	83 B	**DER**	2.53	**TER**	15.04
Environmental	98 A	**% DER < TER**			83.18
CO_2 Emissions (t/year)	0.21	**DFEE**	38.82	**TFEE**	48.70
Compliance Check	See BREL	**% DFEE < TFEE**			20.30
% DPER < TPER	68.18	**DPER**	25.56	**TPER**	80.33

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		95.3800 (1b)	x	2.5000 (2b)	=	238.4500	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3800						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	238.4500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1258 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3758 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20)	=	0.3194 (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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3194	0.3434	0.3594	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			22.8600	1.1450	26.1756			(27)
External Wall	97.4200	24.9600	72.4600	0.1500	10.8690	9.0000	652.1400	(29a)
Communal Wall	18.9000		18.9000	0.1500	2.8350	9.0000	170.1000	(29a)
External Roof	95.3500		95.3500	0.1000	9.5350	9.0000	858.1500	(30)
Total net area of external elements Aum(A, m2)			211.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.5146			(33)
Party Wall			16.1500	0.0000	0.0000	20.0000	323.0000	(32)
Party Floor			95.3500			40.0000	3814.0000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6717.3900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.4277 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		10.5835 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	62.0981 (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	45.8708	45.6173	45.3689	44.2021	43.9838	42.9676	42.9676	42.7794	43.3590	43.9838	44.4255	44.8872	(38)

Heat transfer coeff

	107.9688	107.7154	107.4670	106.3002	106.0819	105.0657	105.0657	104.8775	105.4571	106.0819	106.5235	106.9852 (39)
Average = Sum(39)m / 12 =												106.2992

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1320	1.1293	1.1267	1.1145	1.1122	1.1015	1.1015	1.0996	1.1057	1.1122	1.1168	1.1217	(40)
HLP (average)												1.1145	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6924 (42)

Hot water usage for mixer showers

	95.3744	93.9411	91.8525	87.8564	84.9074	81.6186	79.7493	81.8221	84.0942	87.6253	91.7073	95.0090 (42a)

Hot water usage for baths

	29.9517	29.5068	28.8804	27.7255	26.8606	25.9017	25.3837	26.0057	26.6830	27.7091	28.8879	29.8504 (42b)

Hot water usage for other uses

	42.2033	40.6687	39.1340	37.5993	36.0647	34.5300	34.5300	36.0647	37.5993	39.1340	40.6687	42.2033 (42c)

Average daily hot water use (litres/day) 154.0686 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	167.5294	164.1166	159.8670	153.1812	147.8326	142.0503	139.6629	143.8924	148.3765	154.4684	161.2638	167.0627	(44)
Energy conte	265.3256	233.6999	245.7096	209.6974	199.0111	174.6674	168.9102	178.1689	182.9631	209.6122	229.7499	261.5799	(45)
Energy content (annual)										Total = Sum(45)m =		2559.0950	
Distribution loss (46)m = 0.15 x (45)m													
	39.7988	35.0550	36.8564	31.4546	29.8517	26.2001	25.3365	26.7253	27.4445	31.4418	34.4625	39.2370	(46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.2200 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.7316 (55)

Total storage loss

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)

If cylinder contains dedicated solar storage

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

	373.8628	331.7335	354.2468	314.7334	307.5483	249.1274	245.8522	255.1109	257.4231	318.1494	334.7859	370.1171	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	373.8628	331.7335	354.2468	314.7334	307.5483	249.1274	245.8522	255.1109	257.4231	318.1494	334.7859	370.1171	(64)
										Total per year (kWh/year) = Sum(64)m =		3712.6906	(64)
12Total per year (kWh/year)												3713	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	132.1069	117.3443	125.5845	112.1948	110.0573	76.0865	74.7726	77.8511	78.8448	113.5821	118.8622	130.8614	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	125.4080	138.8445	125.4080	129.5882	125.4080	129.5882	125.4080	125.4080	129.5882	125.4080	129.5882	125.4080	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	248.6353	251.2154	244.7137	230.8724	213.4003	196.9790	186.0086	183.4285	189.9302	203.7714	221.2435	237.6649	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	(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)													
	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	(71)
Water heating gains (Table 5)													
	177.5630	174.6194	168.7964	155.8261	147.9265	105.6757	100.5008	104.6385	109.5067	152.6642	165.0864	175.8890	(72)
Total internal gains													
	614.9929	628.0660	602.3047	579.6734	550.1214	495.6296	475.3040	476.8617	492.4117	545.2302	579.3049	602.3484	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.1000	11.2829	0.6300	0.7000	0.7700	21.0341	(75)
Southeast	3.3800	36.7938	0.6300	0.7000	0.7700	38.0070	(77)
Northwest	13.3800	11.2829	0.6300	0.7000	0.7700	46.1371	(81)

Solar gains	105.1782	201.4689	334.9221	514.3194	666.7486	701.8089	660.0217	540.2054	396.0851	238.6450	130.0424	87.3815	(83)
Total gains	720.1711	829.5349	937.2268	1093.9928	1216.8700	1197.4385	1135.3256	1017.0670	888.4968	783.8752	709.3472	689.7299	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.2822	17.3229	17.3629	17.5535	17.5896	17.7598	17.7598	17.7916	17.6938	17.5896	17.5167	17.4411	
alpha	2.1521	2.1549	2.1575	2.1702	2.1726	2.1840	2.1840	2.1861	2.1796	2.1726	2.1678	2.1627	
util living area													
	0.9118	0.8820	0.8335	0.7380	0.6106	0.4785	0.3712	0.4205	0.6149	0.7918	0.8830	0.9184	(86)
Living	17.9957	18.3698	18.9590	19.7357	20.3565	20.7360	20.8915	20.8545	20.5194	19.7248	18.7466	17.9366	

Non living	17.2422	17.6081	18.1815	18.9268	19.4959	19.8287	19.9462	19.9256	19.6614	18.9373	17.9908	17.1896	
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	19.4631	18.3698	18.9590	19.7357	20.3565	20.7360	20.8915	20.8545	20.5194	19.7248	18.7466	18.3651	(87)
Th 2	19.9748	19.9770	19.9791	19.9890	19.9909	19.9996	19.9996	20.0012	19.9962	19.9909	19.9871	19.9832	(88)
util rest of house	0.9020	0.8693	0.8153	0.7097	0.5689	0.4200	0.2969	0.3434	0.5576	0.7623	0.8682	0.9093	(89)
MIT 2	18.5769	17.6081	18.1815	18.9268	19.4959	19.8287	19.9462	19.9256	19.6614	18.9373	17.9908	17.5804	(90)
Living area fraction										fLA = Living area / (4) =		0.3710	(91)
MIT	18.9057	17.8907	18.4700	19.2269	19.8152	20.1653	20.2970	20.2703	19.9797	19.2295	18.2712	17.8715	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9057	17.8907	18.4700	19.2269	19.8152	20.1653	20.2970	20.2703	19.9797	19.2295	18.2712	17.8715	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8901	0.8366	0.7831	0.6857	0.5610	0.4302	0.3198	0.3651	0.5566	0.7361	0.8367	0.8854	(94)
Useful gains	641.0507	694.0278	733.9861	750.1941	682.7188	515.0906	363.0370	371.3069	494.5345	577.0078	593.5124	610.6781	(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	1576.9640	1399.3037	1286.3814	1097.7529	860.8776	584.7256	388.4257	405.9050	620.0602	915.4292	1189.9990	1462.6524	(97)
Space heating kWh	696.3195	473.9454	410.9821	250.2423	132.5501	0.0000	0.0000	0.0000	0.0000	251.7855	429.4704	633.8689	(98a)
Space heating requirement - total per year (kWh/year)												3279.1642	
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	696.3195	473.9454	410.9821	250.2423	132.5501	0.0000	0.0000	0.0000	0.0000	251.7855	429.4704	633.8689	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3279.1642	
Space heating per m2											(98c) / (4) =	34.3800	(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 %)												305.2188	(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	696.3195	473.9454	410.9821	250.2423	132.5501	0.0000	0.0000	0.0000	0.0000	251.7855	429.4704	633.8689	(98)
Space heating efficiency (main heating system 1)	305.2188	305.2188	305.2188	305.2188	305.2188	0.0000	0.0000	0.0000	0.0000	305.2188	305.2188	305.2188	(210)
Space heating fuel (main heating system)	228.1378	155.2805	134.6516	81.9878	43.4279	0.0000	0.0000	0.0000	0.0000	82.4934	140.7090	207.6769	(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	373.8628	331.7335	354.2468	314.7334	307.5483	249.1274	245.8522	255.1109	257.4231	318.1494	334.7859	370.1171	(64)
Efficiency of water heater												299.5251	(216)
(217)m	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	(217)
Fuel for water heating, kWh/month	124.8185	110.7531	118.2695	105.0775	102.6786	83.1741	82.0807	85.1718	85.9437	106.2179	111.7722	123.5679	(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	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	26.0573	20.9041	18.8219	13.7897	10.6516	8.7024	9.7167	12.6301	16.4053	21.5247	24.3120	26.7815	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.7336	-55.4492	-93.3584	-116.2803	-129.9183	-115.3605	-113.2007	-103.6650	-85.8160	-67.0292	-38.8663	-27.8036	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1074.3650	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	299.5251	
Water heating fuel used	1239.5255	(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)	210.2973	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-980.4811	(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	1543.7067	(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	1074.3650	0.1549	166.4073	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1239.5255	0.1414	175.3218	(264)
Space and water heating			341.7291	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	210.2973	0.1443	30.3524	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-980.4811	0.1330	-130.4369	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-130.4369	(269)
Total CO2, kg/year			241.6446	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5300	(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	1074.3650	1.5734	1690.3995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1239.5255	1.5230	1887.8508	(278)
Space and water heating			3578.2502	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	210.2973	1.5338	322.5610	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-980.4811	1.4916	-1462.4913	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1462.4913	(283)
Total Primary energy kWh/year			2438.3200	(286)
Dwelling Primary energy Rate (DPER)			25.6400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	95.3800	(1b)	x 2.5000	(2b) =	238.4500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		238.4500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1258 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3758 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3194 (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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3194	0.3434	0.3594	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			21.7500	1.1450	24.9046			(27)
External Wall	97.4200	23.8500	73.5700	0.1800	13.2426			(29a)

Communal Wall	18.9000	18.9000	0.1800	3.4020	(29a)
External Roof	95.3500	95.3500	0.1100	10.4885	(30)
Total net area of external elements Aum(A, m2)		211.6700			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		54.1377	(33)
Party Wall		16.1500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.4277 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	13.7700	0.0500	0.6885
E3 Sill	8.7500	0.0500	0.4375
E4 Jamb	42.2300	0.0500	2.1115
E7 Party floor between dwellings (in blocks of flats)	37.4000	0.0700	2.6180
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	9.1200	0.0200	0.1824
E14 Flat roof	7.5600	0.0800	0.6048
E15 Flat roof with parapet	38.9600	0.5600	21.8176
E16 Corner (normal)	17.5000	0.0900	1.5750
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.4600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.4600	0.1200	0.7752
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 30.4355 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 84.5732 (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	45.8708	45.6173	45.3689	44.2021	43.9838	42.9676	42.9676	42.7794	43.3590	43.9838	44.4255	44.8872	(38)
Heat transfer coeff	130.4440	130.1905	129.9421	128.7753	128.5570	127.5408	127.5408	127.3526	127.9322	128.5570	128.9986	129.4603	(39)

Average = Sum(39)m / 12 = 128.7743

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3676	1.3650	1.3624	1.3501	1.3478	1.3372	1.3372	1.3352	1.3413	1.3478	1.3525	1.3573	(40)
HLP (average)												1.3501	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6924 (42)

Hot water usage for mixer showers

69.3632	68.3208	66.8018	63.8956	61.7508	59.3590	57.9995	59.5069	61.1594	63.7275	66.6962	69.0975	(42a)

Hot water usage for baths

29.9517	29.5068	28.8804	27.7255	26.8606	25.9017	25.3837	26.0057	26.6830	27.7091	28.8879	29.8504	(42b)

Hot water usage for other uses

42.2033	40.6687	39.1340	37.5993	36.0647	34.5300	34.5300	36.0647	37.5993	39.1340	40.6687	42.2033	(42c)

Average daily hot water use (litres/day) 130.0871 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	141.5182	138.4963	134.8163	129.2203	124.6761	119.7906	117.9131	121.5773	125.4417	130.5706	136.2527	141.1512	(44)
Energy conte	224.1302	197.2169	207.2076	176.8962	167.8380	147.2966	142.6057	150.5381	154.6822	177.1831	194.1170	221.0086	(45)
Energy content (annual)										Total = Sum(45)m =		2160.7202	
Distribution loss (46)m = 0.15 x (45)m	33.6195	29.5825	31.0811	26.5344	25.1757	22.0945	21.3909	22.5807	23.2023	26.5775	29.1175	33.1513	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	268.3804	237.1848	251.4578	219.7189	212.0881	190.1193	186.8559	194.7883	197.5049	221.4332	236.9397	265.2588	(62)
WWHRS	-31.7100	-28.0446	-29.3666	-24.3167	-22.6623	-19.3923	-18.1772	-19.3296	-20.0640	-23.6533	-26.7963	-31.1227	(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	236.6705	209.1403	222.0911	195.4022	189.4258	170.7270	168.6787	175.4586	177.4409	197.7800	210.1434	234.1361	(64)
									Total per year (kWh/year) = Sum(64)m =			2387.0946	(64)
12Total per year (kWh/year)												2387	(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	109.9234	97.5489	104.2967	93.0762	91.2063	83.2343	82.8165	85.4541	85.6900	94.3135	98.8021	108.8855	(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	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.3824	138.8162	125.3824	129.5618	125.3824	129.5618	125.3824	125.3824	129.5618	125.3824	129.5618	125.3824	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	248.6353	251.2154	244.7137	230.8724	213.4003	196.9790	186.0086	183.4285	189.9302	203.7714	221.2435	237.6649	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	(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)	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	(71)
Water heating gains (Table 5)	147.7466	145.1621	140.1837	129.2725	122.5891	115.6032	111.3126	114.8576	119.0139	126.7655	137.2251	146.3515	(72)
Total internal gains	588.1509	601.5804	576.6665	556.0934	527.7585	505.5307	486.0902	487.0552	501.8926	522.3060	554.4172	575.7854	(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	5.8000	11.2829	0.6300	0.7000	0.7700	19.9996	(75)
Southeast	3.2200	36.7938	0.6300	0.7000	0.7700	36.2078	(77)
Northwest	12.7300	11.2829	0.6300	0.7000	0.7700	43.8958	(81)

Solar gains	100.1032	191.7363	318.7153	489.3941	634.4085	667.7577	628.0021	514.0149	376.9060	227.1092	123.7656	83.1666 (83)
Total gains	688.2542	793.3167	895.3818	1045.4875	1162.1670	1173.2884	1114.0923	1001.0701	878.7986	749.4151	678.1828	658.9520 (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	14.3045	14.3324	14.3598	14.4899	14.5145	14.6302	14.6302	14.6518	14.5854	14.5145	14.4648	14.4132	
alpha	1.9536	1.9555	1.9573	1.9660	1.9676	1.9753	1.9753	1.9768	1.9724	1.9676	1.9643	1.9609	
util living area	0.9255	0.9015	0.8624	0.7836	0.6724	0.5391	0.4296	0.4796	0.6650	0.8285	0.9024	0.9309	(86)
MIT	17.3339	17.7121	18.3497	19.2300	20.0070	20.5576	20.8011	20.7453	20.2829	19.2832	18.1737	17.2707	(87)
Th 2	19.7882	19.7903	19.7923	19.8018	19.8035	19.8118	19.8118	19.8134	19.8086	19.8035	19.8000	19.7962	(88)
util rest of house	0.9161	0.8891	0.8446	0.7546	0.6262	0.4685	0.3337	0.3827	0.6007	0.7989	0.8882	0.9222	(89)
MIT 2	15.6045	16.0736	16.8626	17.9360	18.8498	19.4609	19.6964	19.6558	19.1919	18.0282	16.6601	15.5277	(90)
Living area fraction									fLA = Living area / (4) =			0.3710	(91)
MIT	16.2462	16.6816	17.4144	18.4161	19.2792	19.8678	20.1063	20.0600	19.5967	18.4939	17.2217	16.1744	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.2462	16.6816	17.4144	18.4161	19.2792	19.8678	20.1063	20.0600	19.5967	18.4939	17.2217	16.1744	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8758	0.8449	0.7984	0.7139	0.6032	0.4721	0.3590	0.4044	0.5876	0.7572	0.8451	0.8833	(94)
Useful gains	602.7478	670.2809	714.8809	746.4007	701.0703	553.9598	399.9571	404.8499	516.3555	567.4901	573.0995	582.0630	(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	1558.3102	1533.8524	1418.2345	1225.4388	974.3564	671.8592	447.1936	466.1117	703.2080	1014.8112	1305.6855	1550.2121	(97)
Space heating kWh	710.9385	580.3201	523.2951	344.9074	203.3249	0.0000	0.0000	0.0000	0.0000	332.8069	527.4619	720.3029	(98a)
Space heating requirement - total per year (kWh/year)												3943.3576	
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	710.9385	580.3201	523.2951	344.9074	203.3249	0.0000	0.0000	0.0000	0.0000	332.8069	527.4619	720.3029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3943.3576	
Space heating per m2											(98c) / (4) =	41.3437	(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	710.9385	580.3201	523.2951	344.9074	203.3249	0.0000	0.0000	0.0000	0.0000	332.8069	527.4619	720.3029	(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)	770.2475	628.7325	566.9502	373.6808	220.2870	0.0000	0.0000	0.0000	0.0000	360.5708	571.4647	780.3932	(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	236.6705	209.1403	222.0911	195.4022	189.4258	170.7270	168.6787	175.4586	177.4409	197.7800	210.1434	234.1361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3672	86.2238	85.9130	85.3200	84.2189	79.8000	79.8000	79.8000	79.8000	85.2174	86.0355	86.4093	(217)
Fuel for water heating, kWh/month	274.0281	242.5551	258.5070	229.0227	224.9208	213.9436	211.3768	219.8730	222.3570	232.0886	244.2519	270.9616	(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	26.0520	20.8999	18.8180	13.7869	10.6494	8.7006	9.7147	12.6276	16.4020	21.5203	24.3071	26.7761	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.8403	-26.8803	-41.2566	-49.6260	-56.3857	-53.6742	-53.0053	-48.5926	-41.3550	-32.1073	-20.2124	-15.2281	(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	-5.4356	-11.7652	-24.0213	-37.0431	-49.9526	-50.5655	-49.9875	-41.8877	-30.1257	-17.1513	-7.3581	-4.2752	(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	4272.3267	(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	2843.8863	(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)	210.2545	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-785.7326	(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	6626.7349	(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	4272.3267	0.2100	897.1886	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2843.8863	0.2100	597.2161	(264)
Space and water heating			1494.4047	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	210.2545	0.1443	30.3462	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.1638	0.1332	-60.7735	
PV Unit electricity exported	-329.5688	0.1251	-41.2368	
Total			-102.0103	(269)
Total CO2, kg/year			1434.6699	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0400	(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	4272.3267	1.1300	4827.7292	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2843.8863	1.1300	3213.5915	(278)
Space and water heating			8041.3207	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	210.2545	1.5338	322.4953	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.1638	1.4923	-680.7370	
PV Unit electricity exported	-329.5688	0.4593	-151.3547	
Total			-832.0916	(283)
Total Primary energy kWh/year			7661.8252	(286)
Target Primary Energy Rate (TPER)			80.3300	(287)

Full SAP Calculation Printout

Property Reference	F1	**Issued on Date**	04/10/2024
Assessment Reference	F1_Copy	**Prop Type Ref**	F1
Property	F1		

SAP Rating	83 B	**DER**	2.65	**TER**	15.78
Environmental	98 A	**% DER < TER**			83.21
CO_2 Emissions (t/year)	0.21	**DFEE**	40.63	**TFEE**	50.87
Compliance Check	See BREL	**% DFEE < TFEE**			20.12
% DPER < TPER	68.29	**DPER**	26.74	**TPER**	84.33

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	90.4500	(1b)	x 2.5000	(2b) =	226.1250	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.4500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		226.1250	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1327	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3827	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3253	(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	0.4147	0.4066	0.3985	0.3578	0.3497	0.3090	0.3090	0.3009	0.3253	0.3497	0.3659	0.3822	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5860	0.5827	0.5794	0.5640	0.5611	0.5477	0.5477	0.5453	0.5529	0.5611	0.5670	0.5730	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			22.5500	1.1450	25.8206			(27)
External Wall	92.0500	22.5500	69.5000	0.1500	10.4250	9.0000	625.5000	(29a)
Communal Wall	39.6500	2.1000	37.5500	0.1500	5.6325	9.0000	337.9500	(29a)
External Roof	90.4500		90.4500	0.1000	9.0450	9.0000	814.0500	(30)
Total net area of external elements Aum(A, m2)			222.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.0231			(33)
Party Wall			18.8500	0.0000	0.0000	20.0000	377.0000	(32)
Party Floor			90.4500			40.0000	3618.0000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6672.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.7700 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		11.1075 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	64.1306 (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	43.7277	43.4786	43.2343	42.0871	41.8724	40.8732	40.8732	40.6882	41.2581	41.8724	42.3066	42.7606	(38)
Heat transfer coeff													
	107.8583	107.6092	107.3649	106.2177	106.0030	105.0038	105.0038	104.8188	105.3887	106.0030	106.4373	106.8912	(39)
Average = Sum(39)m / 12 =												106.2166	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1925	1.1897	1.1870	1.1743	1.1720	1.1609	1.1609	1.1589	1.1652	1.1720	1.1768	1.1818	(40)
HLP (average)												1.1743	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6318	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.5146	29.0763	28.4590	27.3209	26.4687	25.5237	25.0133	25.6262	26.2936	27.3048	28.4663	29.4148	(42b)
Hot water usage for other uses													
	41.5826	40.0705	38.5584	37.0463	35.5342	34.0221	34.0221	35.5342	37.0463	38.5584	40.0705	41.5826	(42c)
Average daily hot water use (litres/day)												65.1670	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	71.0972	69.1468	67.0174	64.3672	62.0029	59.5458	59.0354	61.1604	63.3399	65.8632	68.5368	70.9974	(44)
Energy conte	112.6006	98.4641	103.0033	88.1155	83.4678	73.2185	71.3982	75.7294	78.1044	89.3757	97.6433	111.1648	(45)
Energy content (annual)										Total = Sum(45)m =		1082.2854	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	95.7105	83.6945	87.5528	74.8981	70.9476	62.2357	60.6885	64.3700	66.3888	75.9693	82.9968	94.4901	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	95.7105	83.6945	87.5528	74.8981	70.9476	62.2357	60.6885	64.3700	66.3888	75.9693	82.9968	94.4901	(64)
										Total per year (kWh/year) = Sum(64)m =		919.9426	(64)
12Total per year (kWh/year)												920	(64)
Electric shower(s)													
	54.7345	48.7689	53.2537	50.8194	51.7730	49.3864	51.0326	51.7730	50.8194	53.2537	52.2524	54.7345	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							622.6014	(64a)
Heat gains from water heating, kWh/month													
	37.6112	33.1158	35.2016	31.4294	30.6802	27.9055	27.9303	29.0357	29.3020	32.3058	33.8123	37.3061	(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	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	121.0036	133.9683	121.0036	125.0371	121.0036	125.0371	121.0036	121.0036	125.0371	121.0036	125.0371	121.0036	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.9032	242.3926	236.1193	222.7642	205.9057	190.0611	179.4759	176.9865	183.2598	196.6149	213.4734	229.3180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	(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)													
	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	(71)
Water heating gains (Table 5)													
	50.5527	49.2795	47.3140	43.6519	41.2368	38.7577	37.5407	39.0265	40.6973	43.4217	46.9615	50.1427	(72)
Total internal gains													
	473.9370	488.1179	466.9144	453.9306	430.6235	416.3333	400.4976	399.4940	411.4716	423.5177	447.9494	462.9417	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.1200	10.6334	0.6300	0.7000	0.7700	13.3888	(74)
East	5.1100	19.6403	0.6300	0.7000	0.7700	30.6719	(76)
West	13.3200	19.6403	0.6300	0.7000	0.7700	79.9509	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	124.0115	241.9882	399.8605	589.5995	731.0652	752.7830	714.8257	607.8553	466.7623	287.2363	154.4504	102.1323	(83)
Total gains	597.9485	730.1061	866.7749	1043.5300	1161.6887	1169.1163	1115.3233	1007.3494	878.2338	710.7540	602.3998	565.0740	(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	17.1843	17.2241	17.2633	17.4498	17.4851	17.6515	17.6515	17.6826	17.5870	17.4851	17.4138	17.3398	
alpha	2.1456	2.1483	2.1509	2.1633	2.1657	2.1768	2.1768	2.1788	2.1725	2.1657	2.1609	2.1560	
util living area													
	0.9353	0.9032	0.8506	0.7517	0.6265	0.4864	0.3763	0.4232	0.6182	0.8171	0.9097	0.9418	(86)
MIT	17.7324	18.1737	18.8392	19.6727	20.3153	20.7244	20.8872	20.8510	20.5099	19.6160	18.5336	17.6612	(87)
Th 2	19.9260	19.9282	19.9304	19.9406	19.9425	19.9514	19.9514	19.9531	19.9480	19.9425	19.9386	19.9346	(88)
util rest of house													

	0.9274	0.8918	0.8329	0.7228	0.5828	0.4245	0.2975	0.3419	0.5581	0.7883	0.8970	0.9347	(89)
MIT 2	16.9508	17.3837	18.0319	18.8315	19.4207	19.7765	19.8979	19.8783	19.6123	18.8016	17.7512	16.8860	(90)
Living area fraction										fLA = Living area / (4) =		0.4270	(91)
MIT	17.2845	17.7210	18.3766	19.1907	19.8027	20.1812	20.3203	20.2936	19.9955	19.1493	18.0853	17.2170	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2845	17.7210	18.3766	19.1907	19.8027	20.1812	20.3203	20.2936	19.9955	19.1493	18.0853	17.2170	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9009	0.8613	0.8016	0.6996	0.5766	0.4387	0.3262	0.3695	0.5610	0.7625	0.8681	0.9096	(94)
Useful gains	538.6924	628.8581	694.8173	730.0345	669.7993	512.8914	363.8234	372.1868	492.7244	541.9462	522.9648	514.0112	(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													
	1400.4885	1379.6597	1275.1313	1093.0530	858.9077	586.0506	390.6490	408.1241	621.3230	906.2560	1169.2439	1391.4045	(97)
Space heating kWh													
	641.1763	504.5387	431.7536	261.3733	140.6966	0.0000	0.0000	0.0000	0.0000	271.0464	465.3210	652.7806	(98a)
Space heating requirement - total per year (kWh/year)												3368.6866	
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													
	641.1763	504.5387	431.7536	261.3733	140.6966	0.0000	0.0000	0.0000	0.0000	271.0464	465.3210	652.7806	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3368.6866	
Space heating per m2											(98c) / (4) =	37.2436	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
	0.0000	0.0000	0.0000	0.0000	0.0000	987.0360	777.0283	796.6228	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7775	0.8291	0.7958	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	767.4500	644.2576	633.9598	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1318.9539	1258.4251	1134.5952	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	397.0828	456.9406	372.4728	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	99.2707	114.2352	93.1182	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												306.6241	(107)
Energy for space heating												37.2436	(99)
Energy for space cooling												3.3900	(108)
Total												40.6336	(109)
Fabric Energy Efficiency (DFEE)												40.6	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		90.4500	(1b)	x 2.5000	(2b) =	226.1250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.4500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		226.1250	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1327 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3827 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3253 (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

	0.4147	0.4066	0.3985	0.3578	0.3497	0.3090	0.3090	0.3009	0.3253	0.3497	0.3659	0.3822 (22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5860	0.5827	0.5794	0.5640	0.5611	0.5477	0.5477	0.5453	0.5529	0.5611	0.5670	0.5730 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.5200	1.1450	23.4962			(27)
External Wall	92.0500	20.5200	71.5300	0.1800	12.8754			(29a)
Communal Wall	39.6500	2.1000	37.5500	0.1800	6.7590			(29a)
External Roof	90.4500		90.4500	0.1100	9.9495			(30)
Total net area of external elements Aum(A, m2)			222.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.1801			(33)
Party Wall			18.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.7700 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	13.8000	0.0500	0.6900
E3	Sill	9.6000	0.0500	0.4800
E4	Jamb	44.8000	0.0500	2.2400
E7	Party floor between dwellings (in blocks of flats)	46.0400	0.0700	3.2228
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	6.6400	0.0200	0.1328
E14	Flat roof	15.8600	0.0800	1.2688
E15	Flat roof with parapet	36.8200	0.5600	20.6192
E16	Corner (normal)	20.0000	0.0900	1.8000
E17	Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E18	Party wall between dwellings	2.5000	0.0600	0.1500
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5400	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	7.5400	0.1200	0.9048

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 30.6084 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 85.7885 (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	43.7277	43.4786	43.2343	42.0871	41.8724	40.8732	40.8732	40.6882	41.2581	41.8724	42.3066	42.7606	(38)
Heat transfer coeff	129.5162	129.2670	129.0228	127.8756	127.6609	126.6617	126.6617	126.4767	127.0466	127.6609	128.0951	128.5491	(39)
Average = Sum(39)m / 12 =												127.8745	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4319	1.4292	1.4265	1.4138	1.4114	1.4004	1.4004	1.3983	1.4046	1.4114	1.4162	1.4212	(40)
HLP (average)												1.4138	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6318 (42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)

Hot water usage for baths

	29.5146	29.0763	28.4590	27.3209	26.4687	25.5237	25.0133	25.6262	26.2936	27.3048	28.4663	29.4148 (42b)

Hot water usage for other uses

	41.5826	40.0705	38.5584	37.0463	35.5342	34.0221	34.0221	35.5342	37.0463	38.5584	40.0705	41.5826 (42c)

Average daily hot water use (litres/day) 65.1670 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.0972	69.1468	67.0174	64.3672	62.0029	59.5458	59.0354	61.1604	63.3399	65.8632	68.5368	70.9974	(44)
Energy conte	112.6006	98.4641	103.0033	88.1155	83.4678	73.2185	71.3982	75.7294	78.1044	89.3757	97.6433	111.1648	(45)
Energy content (annual)										Total = Sum(45)m =		1082.2854	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	95.7105	83.6945	87.5528	74.8981	70.9476	62.2357	60.6885	64.3700	66.3888	75.9693	82.9968	94.4901	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	95.7105	83.6945	87.5528	74.8981	70.9476	62.2357	60.6885	64.3700	66.3888	75.9693	82.9968	94.4901	(64)
										Total per year (kWh/year) = Sum(64)m =		919.9426	(64)
12Total per year (kWh/year)												920	(64)
Electric shower(s)													
	54.7345	48.7689	53.2537	50.8194	51.7730	49.3864	51.0326	51.7730	50.8194	53.2537	52.2524	54.7345	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		622.6014	(64a)
Heat gains from water heating, kWh/month													
	37.6112	33.1158	35.2016	31.4294	30.6802	27.9055	27.9303	29.0357	29.3020	32.3058	33.8123	37.3061	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	120.9794	133.9414	120.9794	125.0120	120.9794	125.0120	120.9794	120.9794	125.0120	120.9794	125.0120	120.9794	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.9032	242.3926	236.1193	222.7642	205.9057	190.0611	179.4759	176.9865	183.2598	196.6149	213.4734	229.3180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	(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)													
	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	(71)
Water heating gains (Table 5)													
	50.5527	49.2795	47.3140	43.6519	41.2368	38.7577	37.5407	39.0265	40.6973	43.4217	46.9615	50.1427	(72)
Total internal gains													
	473.9127	488.0910	466.8901	453.9055	430.5992	416.3082	400.4734	399.4698	411.4465	423.4935	447.9244	462.9175	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.7500	10.6334	0.6300	0.7000	0.7700	12.1864	(74)
East	4.6500	19.6403	0.6300	0.7000	0.7700	27.9108	(76)
West	12.1200	19.6403	0.6300	0.7000	0.7700	72.7481	(80)

Solar gains	112.8453	220.1990	363.8564	536.5124	665.2427	685.0061	650.4658	553.1252	424.7346	261.3728	140.5433	92.9362	(83)
Total gains	586.7580	708.2900	830.7465	990.4179	1095.8419	1101.3143	1050.9392	952.5950	836.1811	684.8663	588.4677	555.8536	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	14.3107	14.3383	14.3655	14.4943	14.5187	14.6332	14.6332	14.6547	14.5889	14.5187	14.4695	14.4184	
alpha	1.9540	1.9559	1.9577	1.9663	1.9679	1.9755	1.9755	1.9770	1.9726	1.9679	1.9646	1.9612	
util living area													
	0.9418	0.9164	0.8752	0.7960	0.6893	0.5588	0.4465	0.4942	0.6791	0.8469	0.9210	0.9472	(86)
MIT	17.1435	17.5666	18.2551	19.1696	19.9573	20.5267	20.7864	20.7306	20.2527	19.1952	18.0156	17.0726	(87)
Th 2	19.7390	19.7411	19.7431	19.7528	19.7546	19.7631	19.7631	19.7646	19.7598	19.7546	19.7509	19.7471	(88)
util rest of house													
	0.9339	0.9052	0.8579	0.7667	0.6418	0.4845	0.3440	0.3915	0.6125	0.8181	0.9084	0.9400	(89)
MIT 2	16.2624	16.6787	17.3529	18.2372	18.9701	19.4712	19.6683	19.6369	19.2590	18.2860	17.1343	16.1973	(90)
Living area fraction										fLA = Living area / (4) =		0.4270	(91)
MIT	16.6386	17.0578	17.7381	18.6353	19.3916	19.9218	20.1457	20.1039	19.6833	18.6742	17.5106	16.5710	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.6386	17.0578	17.7381	18.6353	19.3916	19.9218	20.1457	20.1039	19.6833	18.6742	17.5106	16.5710	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9058	0.8723	0.8222	0.7353	0.6261	0.4948	0.3778	0.4219	0.6078	0.7864	0.8771	0.9134	(94)
Useful gains	531.4748	617.8615	683.0752	728.2308	686.1050	544.9677	396.9973	401.8821	508.2348	538.5979	516.1688	507.7011	(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													
	1598.0478	1571.5993	1449.9722	1244.9065	981.9141	674.0738	449.1005	468.4559	709.3393	1030.7584	1333.5468	1590.2845	(97)
Space heating kWh													
	793.5303	640.9118	570.5714	372.0065	220.0820	0.0000	0.0000	0.0000	0.0000	366.1673	588.5121	805.4420	(98a)
Space heating requirement - total per year (kWh/year)												4357.2234	
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													
	793.5303	640.9118	570.5714	372.0065	220.0820	0.0000	0.0000	0.0000	0.0000	366.1673	588.5121	805.4420	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4357.2234	
Space heating per m2											(98c) / (4) =	48.1727	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
	0.0000	0.0000	0.0000	0.0000	0.0000	1190.6200	937.2966	961.2226	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6773	0.7377	0.6992	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	806.3524	691.4372	672.0723	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1239.7320	1183.1970	1070.6220	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	312.0333	365.8693	296.5210	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	78.0083	91.4673	74.1302	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												243.6059	(107)
Energy for space heating												48.1727	(99)
Energy for space cooling												2.6933	(108)
Total												50.8660	(109)
Fabric Energy Efficiency (TFEE)												50.9	(109)

Full SAP Calculation Printout

Property Reference	F2	**Issued on Date**	04/10/2024
Assessment Reference	F2_Copy	**Prop Type Ref**	F2
Property	F2		

SAP Rating	84 B	**DER**	2.49	**TER**	15.19
Environmental	98 A	**% DER < TER**			83.61
CO_2 Emissions (t/year)	0.17	**DFEE**	34.63	**TFEE**	45.08
Compliance Check	See BREL	**% DFEE < TFEE**			23.19
% DPER < TPER	68.94	**DPER**	25.25	**TPER**	81.29

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	79.5600 (1b)	x	2.5000 (2b)	=	198.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	198.9000	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1508	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4008	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3407	(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	0.4344	0.4259	0.4174	0.3748	0.3663	0.3237	0.3237	0.3152	0.3407	0.3663	0.3833	0.4003	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5944	0.5907	0.5871	0.5702	0.5671	0.5524	0.5524	0.5497	0.5580	0.5671	0.5735	0.5801	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			20.7500	1.1450	23.7595			(27)
External Wall	88.1900	22.8500	65.3400	0.1500	9.8010	9.0000	588.0600	(29a)
External Roof	79.5600		79.5600	0.1000	7.9560	9.0000	716.0400	(30)
Total net area of external elements Aum(A, m2)			167.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.6165			(33)
Party Wall			30.1000	0.0000	0.0000	20.0000	602.0000	(32)
Party Floor			79.5600			40.0000	3182.4000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 5988.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	75.2702 (35)
Thermal bridges (User defined value 0.050 * total exposed area)	8.3875 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 52.0040 (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	39.0114	38.7710	38.5352	37.4281	37.2209	36.2566	36.2566	36.0781	36.6281	37.2209	37.6400	38.0781	(38)
Heat transfer coeff													
	91.0155	90.7750	90.5393	89.4321	89.2250	88.2607	88.2607	88.0821	88.6321	89.2250	89.6440	90.0821	(39)
Average = Sum(39)m / 12 =												89.4311	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1440	1.1410	1.1380	1.1241	1.1215	1.1094	1.1094	1.1071	1.1140	1.1215	1.1267	1.1323	(40)
HLP (average)												1.1241	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4545	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	28.2357	27.8164	27.2259	26.1371	25.3218	24.4177	23.9294	24.5158	25.1543	26.1216	27.2329	28.1403	(42b)
Hot water usage for other uses													
	39.7661	38.3201	36.8740	35.4280	33.9820	32.5359	32.5359	33.9820	35.4280	36.8740	38.3201	39.7661	(42c)
Average daily hot water use (litres/day)												62.3300	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	68.0018	66.1365	64.0999	61.5650	59.3037	56.9537	56.4653	58.4978	60.5823	62.9957	65.5529	67.9064	(44)
Energy conte	107.6983	94.1774	98.5192	84.2795	79.8342	70.0312	68.2899	72.4325	74.7040	85.4845	93.3922	106.3250	(45)
Energy content (annual)										Total = Sum(45)m =		1035.1678	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	91.5435	80.0508	83.7413	71.6376	67.8591	59.5265	58.0464	61.5676	63.4984	72.6618	79.3833	90.3762	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	91.5435	80.0508	83.7413	71.6376	67.8591	59.5265	58.0464	61.5676	63.4984	72.6618	79.3833	90.3762	(64)
										Total per year (kWh/year) = Sum(64)m =		879.8926	(64)
12Total per year (kWh/year)												880	(64)
Electric shower(s)													
	52.3528	46.6468	50.9365	48.6081	49.5202	47.2375	48.8120	49.5202	48.6081	50.9365	49.9787	52.3528	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		595.5102	(64a)
Heat gains from water heating, kWh/month													
	35.9741	31.6744	33.6694	30.0614	29.3448	26.6910	26.7146	27.7719	28.0266	30.8996	32.3405	35.6823	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.2175	122.0265	110.2175	113.8914	110.2175	113.8914	110.2175	110.2175	113.8914	110.2175	113.8914	110.2175	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	218.5185	220.7860	215.0719	202.9072	187.5515	173.1192	163.4776	161.2101	166.9242	179.0889	194.4446	208.8769	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	(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)													
	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	(71)
Water heating gains (Table 5)													
	48.3523	47.1345	45.2546	41.7520	39.4420	37.0708	35.9068	37.3279	38.9259	41.5317	44.9174	47.9600	(72)
Total internal gains													
	436.9051	449.7639	430.3609	418.3675	397.0278	383.8983	369.4188	368.5723	379.5584	390.6550	413.0703	426.8713	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.5100	19.6403	0.6300	0.7000	0.7700	45.0774	(76)
South	13.2400	46.7521	0.6300	0.7000	0.7700	189.1736	(78)

Solar gains	234.2511	397.9987	539.8743	657.8402	724.3698	713.0224	690.0181	641.7320	581.1601	438.8016	280.4415	200.5329	(83)
Total gains	671.1562	847.7626	970.2352	1076.2077	1121.3976	1096.9207	1059.4369	1010.3044	960.7184	829.4566	693.5118	627.4042	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	18.2768	18.3252	18.3729	18.6004	18.6436	18.8473	18.8473	18.8855	18.7683	18.6436	18.5564	18.4662	
alpha	2.2185	2.2217	2.2249	2.2400	2.2429	2.2565	2.2565	2.2590	2.2512	2.2429	2.2371	2.2311	
util living area													
	0.9019	0.8486	0.7862	0.6933	0.5829	0.4518	0.3415	0.3689	0.5278	0.7294	0.8594	0.9128	(86)
MIT	18.2391	18.7573	19.3358	19.9774	20.4634	20.7879	20.9187	20.9005	20.6808	20.0163	19.0239	18.1470	(87)
Th 2	19.9651	19.9675	19.9699	19.9812	19.9833	19.9932	19.9932	19.9950	19.9894	19.9833	19.9790	19.9746	(88)
util rest of house													
	0.8909	0.8328	0.7644	0.6624	0.5401	0.3940	0.2708	0.2974	0.4705	0.6949	0.8420	0.9030	(89)
MIT 2	17.4662	17.9677	18.5239	19.1348	19.5769	19.8589	19.9546	19.9454	19.7755	19.1886	18.2445	17.3830	(90)

Living area fraction										fLA = Living area / (4) =		0.4183	(91)
MIT	17.7895	18.2980	18.8635	19.4873	19.9477	20.2475	20.3578	20.3450	20.1542	19.5348	18.5705	17.7026	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7895	18.2980	18.8635	19.4873	19.9477	20.2475	20.3578	20.3450	20.1542	19.5348	18.5705	17.7026	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8614	0.8023	0.7376	0.6461	0.5385	0.4091	0.2971	0.3230	0.4803	0.6778	0.8128	0.8747	(94)
Useful gains	578.1564	680.1721	715.6633	695.2935	603.8694	448.7774	314.7059	326.3751	461.4412	562.2168	563.6897	548.7852	(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	1227.7568	1216.2044	1119.3835	946.8411	735.8998	498.4557	331.6699	347.4796	536.5939	797.2102	1028.2618	1216.3398	(97)
Space heating kWh	483.3027	360.2137	300.3679	181.1143	98.2306	0.0000	0.0000	0.0000	0.0000	174.8351	334.4919	496.6606	(98a)
Space heating requirement - total per year (kWh/year)												2429.2168	
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	483.3027	360.2137	300.3679	181.1143	98.2306	0.0000	0.0000	0.0000	0.0000	174.8351	334.4919	496.6606	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2429.2168	
Space heating per m2											(98c) / (4) =	30.5331	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	0.0000	0.0000	0.0000	0.0000	0.0000	829.6504	653.1290	669.4240	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8168	0.8657	0.8500	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	677.6970	565.4033	569.0179	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1239.7745	1198.1086	1142.8314	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	404.6958	470.7327	426.9172	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	101.1740	117.6832	106.7293	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												325.5865	(107)
Energy for space heating												30.5331	(99)
Energy for space cooling												4.0923	(108)
Total												34.6255	(109)
Fabric Energy Efficiency (DFEE)												34.6	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		79.5600 (1b)	x	2.5000 (2b)	=	198.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.5600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	198.9000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1508	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4008	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3407	(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	0.4344	0.4259	0.4174	0.3748	0.3663	0.3237	0.3237	0.3152	0.3407	0.3663	0.3833	0.4003	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5944	0.5907	0.5871	0.5702	0.5671	0.5524	0.5524	0.5497	0.5580	0.5671	0.5735	0.5801 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			17.7900	1.1450	20.3702			(27)
External Wall	88.1900	19.8900	68.3000	0.1800	12.2940			(29a)
External Roof	79.5600		79.5600	0.1100	8.7516			(30)
Total net area of external elements Aum(A, m2)			167.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.5158			(33)
Party Wall			30.1000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.2702 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	12.3900	0.0500	0.6195
E3	Sill	7.0500	0.0500	0.3525
E4	Jamb	32.4000	0.0500	1.6200
E7	Party floor between dwellings (in blocks of flats)	29.8100	0.0700	2.0867
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.4600	0.0200	0.1092
E15	Flat roof with parapet	35.2700	0.5600	19.7512
E16	Corner (normal)	10.0000	0.0900	0.9000
E17	Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E18	Party wall between dwellings	7.5000	0.0600	0.4500
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	12.0400	0.1200	1.4448
E25	Staggered party wall between dwellings	2.5000	0.0600	0.1500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 27.0339 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 70.5497 (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	39.0114	38.7710	38.5352	37.4281	37.2209	36.2566	36.2566	36.0781	36.6281	37.2209	37.6400	38.0781	(38)
Heat transfer coeff	109.5612	109.3207	109.0850	107.9778	107.7707	106.8064	106.8064	106.6278	107.1778	107.7707	108.1897	108.6278	(39)
Average = Sum(39)m / 12 =												107.9768	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3771	1.3741	1.3711	1.3572	1.3546	1.3425	1.3425	1.3402	1.3471	1.3546	1.3599	1.3654	(40)
HLP (average)												1.3572	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4545 (42)
Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)

Hot water usage for baths

	28.2357	27.8164	27.2259	26.1371	25.3218	24.4177	23.9294	24.5158	25.1543	26.1216	27.2329	28.1403 (42b)

Hot water usage for other uses

	39.7661	38.3201	36.8740	35.4280	33.9820	32.5359	32.5359	33.9820	35.4280	36.8740	38.3201	39.7661 (42c)

Average daily hot water use (litres/day) 62.3300 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.0018	66.1365	64.0999	61.5650	59.3037	56.9537	56.4653	58.4978	60.5823	62.9957	65.5529	67.9064	(44)
Energy conte	107.6983	94.1774	98.5192	84.2795	79.8342	70.0312	68.2899	72.4325	74.7040	85.4845	93.3922	106.3250	(45)
Energy content (annual)										Total = Sum(45)m =		1035.1678	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	91.5435	80.0508	83.7413	71.6376	67.8591	59.5265	58.0464	61.5676	63.4984	72.6618	79.3833	90.3762	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	91.5435	80.0508	83.7413	71.6376	67.8591	59.5265	58.0464	61.5676	63.4984	72.6618	79.3833	90.3762	(64)
										Total per year (kWh/year) = Sum(64)m =		879.8926	(64)
12Total per year (kWh/year)												880	(64)
Electric shower(s)													
	52.3528	46.6468	50.9365	48.6081	49.5202	47.2375	48.8120	49.5202	48.6081	50.9365	49.9787	52.3528	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 595.5102 (64a)													
Heat gains from water heating, kWh/month													
	35.9741	31.6744	33.6694	30.0614	29.3448	26.6910	26.7146	27.7719	28.0266	30.8996	32.3405	35.6823	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.2116	122.0200	110.2116	113.8853	110.2116	113.8853	110.2116	110.2116	113.8853	110.2116	113.8853	110.2116	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	218.5185	220.7860	215.0719	202.9072	187.5515	173.1192	163.4776	161.2101	166.9242	179.0889	194.4446	208.8769	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	(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)													

	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	(71)
Water heating gains (Table 5)													
	48.3523	47.1345	45.2546	41.7520	39.4420	37.0708	35.9068	37.3279	38.9259	41.5317	44.9174	47.9600	(72)
Total internal gains													
	436.8992	449.7574	430.3550	418.3614	397.0219	383.8923	369.4129	368.5665	379.5523	390.6491	413.0642	426.8654	(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	
East	6.4400	19.6403	0.6300	0.7000	0.7700	38.6549	(76)
South	11.3500	46.7521	0.6300	0.7000	0.7700	162.1692	(78)

Solar gains	200.8242	341.2087	462.8472	563.9918	621.0373	611.3114	591.5875	550.1845	498.2459	376.1915	240.4240	171.9171	(83)
Total gains	637.7234	790.9661	893.2022	982.3531	1018.0592	995.2036	961.0004	918.7509	877.7982	766.8406	653.4882	598.7825	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.1830	15.2164	15.2493	15.4057	15.4353	15.5747	15.5747	15.6007	15.5207	15.4353	15.3755	15.3135	
alpha	2.0122	2.0144	2.0166	2.0270	2.0290	2.0383	2.0383	2.0400	2.0347	2.0290	2.0250	2.0209	
util living area													
	0.9185	0.8792	0.8327	0.7593	0.6646	0.5399	0.4234	0.4526	0.6116	0.7860	0.8863	0.9268	(86)
MIT	17.5726	18.0633	18.6858	19.4434	20.0950	20.5916	20.8240	20.7915	20.4352	19.5602	18.4355	17.4851	(87)
Th 2	19.7809	19.7833	19.7856	19.7963	19.7983	19.8077	19.8077	19.8095	19.8041	19.7983	19.7942	19.7900	(88)
util rest of house													
	0.9080	0.8644	0.8117	0.7279	0.6171	0.4681	0.3272	0.3573	0.5445	0.7512	0.8697	0.9173	(89)
MIT 2	16.7032	17.1811	17.7855	18.5149	19.1189	19.5554	19.7291	19.7110	19.4323	18.6442	17.5615	16.6232	(90)
Living area fraction										fLA = Living area / (4) =		0.4183	(91)
MIT	17.0669	17.5502	18.1621	18.9033	19.5272	19.9888	20.1871	20.1629	19.8518	19.0274	17.9271	16.9837	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0669	17.5502	18.1621	18.9033	19.5272	19.9888	20.1871	20.1629	19.8518	19.0274	17.9271	16.9837	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8764	0.8294	0.7774	0.7009	0.6052	0.4798	0.3595	0.3874	0.5474	0.7246	0.8364	0.8872	(94)
Useful gains	558.8880	656.0603	694.4016	688.4861	616.1691	477.4981	345.4707	355.8825	480.5485	555.6754	546.5787	531.2406	(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													
	1398.7513	1382.9234	1272.1589	1080.1375	843.5412	575.5635	383.1232	401.2349	616.4695	908.2258	1171.3802	1388.6698	(97)
Space heating kWh													
	624.8583	488.4520	429.8515	281.9890	169.1648	0.0000	0.0000	0.0000	0.0000	262.2975	449.8571	637.9273	(98a)
Space heating requirement - total per year (kWh/year)												3344.3976	
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													
	624.8583	488.4520	429.8515	281.9890	169.1648	0.0000	0.0000	0.0000	0.0000	262.2975	449.8571	637.9273	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3344.3976	
Space heating per m2											(98c) / (4) =	42.0362	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
	0.0000	0.0000	0.0000	0.0000	0.0000	1003.9798	790.3671	810.3712	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7070	0.7692	0.7491	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	709.8543	607.9390	607.0769	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1120.8910	1083.0592	1035.8271	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	295.9464	353.4894	318.9901	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	73.9866	88.3724	79.7475	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												242.1065	(107)
Energy for space heating												42.0362	(99)
Energy for space cooling												3.0431	(108)
Total												45.0792	(109)
Fabric Energy Efficiency (TFEE)												45.1	(109)

Full SAP Calculation Printout

Property Reference	F3	**Issued on Date**	04/10/2024
Assessment Reference	F3_Copy	**Prop Type Ref**	F3
Property	F3		

SAP Rating	84 B	**DER**	2.46	**TER**	14.69
Environmental	98 A	**% DER < TER**			83.25
CO_2 Emissions (t/year)	0.17	**DFEE**	33.69	**TFEE**	43.47
Compliance Check	See BREL	**% DFEE < TFEE**			22.48
% DPER < TPER	68.31	**DPER**	24.90	**TPER**	78.58

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	82.2900	(1b)	x 2.5000	(2b) =	205.7250	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.2900					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	205.7250	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1458	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3958	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3365	(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	0.4290	0.4206	0.4122	0.3701	0.3617	0.3196	0.3196	0.3112	0.3365	0.3617	0.3785	0.3953	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5920	0.5884	0.5849	0.5685	0.5654	0.5511	0.5511	0.5484	0.5566	0.5654	0.5716	0.5781	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	78.2400	19.0000	59.2400	0.1500	8.8860	9.0000	533.1600	(29a)
Communal Wall	19.7000	2.1000	17.6000	0.1500	2.6400	9.0000	158.4000	(29a)
External Roof	82.2900		82.2900	0.1000	8.2290	9.0000	740.6100	(30)
Total net area of external elements Aum(A, m2)			180.2300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.6107			(33)
Party Wall			27.2000	0.0000	0.0000	20.0000	544.0000	(32)
Party Floor			82.2900			40.0000	3291.6000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6167.7700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		74.9516 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		9.0115 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.6222 (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	40.1911	39.9486	39.7108	38.5941	38.3851	37.4125	37.4125	37.2324	37.7872	38.3851	38.8078	39.2497	(38)
Heat transfer coeff													
	92.8134	92.5708	92.3330	91.2163	91.0074	90.0347	90.0347	89.8546	90.4094	91.0074	91.4300	91.8719	(39)
Average = Sum(39)m / 12 =												91.2153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1279	1.1249	1.1220	1.1085	1.1059	1.0941	1.0941	1.0919	1.0987	1.1059	1.1111	1.1164	(40)
HLP (average)												1.1085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5049	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	28.5992	28.1745	27.5764	26.4736	25.6478	24.7321	24.2375	24.8315	25.4781	26.4579	27.5835	28.5026	(42b)
Hot water usage for other uses													
	40.2824	38.8176	37.3528	35.8880	34.4232	32.9584	32.9584	34.4232	35.8880	37.3528	38.8176	40.2824	(42c)
Average daily hot water use (litres/day)												63.1364	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	68.8817	66.9921	64.9292	62.3616	60.0710	57.6905	57.1959	59.2546	61.3661	63.8107	66.4011	68.7850	(44)
Energy conte	109.0918	95.3959	99.7938	85.3699	80.8671	70.9372	69.1735	73.3696	75.6706	86.5906	94.6005	107.7007	(45)
Energy content (annual)										Total = Sum(45)m =		1048.5610	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	92.7280	81.0865	84.8247	72.5644	68.7370	60.2966	58.7974	62.3642	64.3200	73.6020	80.4105	91.5456	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	92.7280	81.0865	84.8247	72.5644	68.7370	60.2966	58.7974	62.3642	64.3200	73.6020	80.4105	91.5456	(64)
										Total per year (kWh/year) = Sum(64)m =		891.2768	(64)
12Total per year (kWh/year)												891	(64)
Electric shower(s)													
	53.0298	47.2500	51.5952	49.2366	50.1606	47.8483	49.4432	50.1606	49.2366	51.5952	50.6250	53.0298	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							603.2109	(64a)
Heat gains from water heating, kWh/month													
	36.4394	32.0841	34.1050	30.4503	29.7244	27.0362	27.0602	28.1312	28.3892	31.2993	32.7589	36.1438	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	113.0629	125.1768	113.0629	116.8317	113.0629	116.8317	113.0629	113.0629	116.8317	113.0629	116.8317	113.0629	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	224.1599	226.4860	220.6244	208.1456	192.3934	177.5886	167.6981	165.3720	171.2337	183.7124	199.4646	214.2694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	(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)													
	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	(71)
Water heating gains (Table 5)													
	48.9778	47.7442	45.8400	42.2920	39.9521	37.5503	36.3712	37.8107	39.4294	42.0689	45.4984	48.5804	(72)
Total internal gains													
	446.7738	459.9802	440.1005	427.8425	405.9817	392.5438	377.7054	376.8188	388.0679	399.4174	422.3679	436.4859	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	690.9818	862.1239	958.8859	1026.5910	1042.6856	1011.3853	979.7288	951.4462	934.1113	834.8817	712.2253	647.2598	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	18.4593	18.5077	18.5553	18.7825	18.8256	19.0290	19.0290	19.0671	18.9501	18.8256	18.7386	18.6485	
alpha	2.2306	2.2338	2.2370	2.2522	2.2550	2.2686	2.2686	2.2711	2.2633	2.2550	2.2492	2.2432	
util living area													
	0.9013	0.8504	0.7964	0.7172	0.6180	0.4884	0.3718	0.3948	0.5463	0.7350	0.8590	0.9121	(86)
MIT	18.2701	18.7678	19.3024	19.9094	20.3999	20.7544	20.9047	20.8875	20.6618	20.0110	19.0460	18.1806	(87)
Th 2	19.9781	19.9805	19.9829	19.9939	19.9960	20.0056	20.0056	20.0074	20.0019	19.9960	19.9918	19.9874	(88)
util rest of house													
	0.8904	0.8350	0.7754	0.6875	0.5758	0.4289	0.2972	0.3206	0.4890	0.7010	0.8418	0.9022	(89)

MIT 2	17.5052	17.9873	18.5030	19.0853	19.5365	19.8477	19.9595	19.9504	19.7732	19.1943	18.2747	17.4243	(90)
Living area fraction									fLA = Living area / (4) =			0.3739	(91)
MIT	17.7912	18.2791	18.8019	19.3934	19.8593	20.1867	20.3130	20.3008	20.1054	19.4997	18.5631	17.7071	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7912	18.2791	18.8019	19.3934	19.8593	20.1867	20.3130	20.3008	20.1054	19.4997	18.5631	17.7071	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8606	0.8039	0.7473	0.6679	0.5696	0.4403	0.3210	0.3433	0.4953	0.6822	0.8120	0.8736	(94)
Useful gains	594.6486	693.1041	716.5421	685.6992	593.9084	445.2742	314.4969	326.6773	462.7017	569.5667	578.3482	565.4390	(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	1252.1667	1238.5160	1135.8751	957.1730	742.5573	503.0013	334.2946	350.5033	542.9474	809.9381	1048.0705	1240.9222	(97)
Space heating kWh	489.1934	366.5168	311.9838	195.4611	110.5947	0.0000	0.0000	0.0000	0.0000	178.8363	338.2001	502.5595	(98a)
Space heating requirement - total per year (kWh/year)												2493.3457	
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	489.1934	366.5168	311.9838	195.4611	110.5947	0.0000	0.0000	0.0000	0.0000	178.8363	338.2001	502.5595	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2493.3457	
Space heating per m2											(98c) / (4) =	30.2995	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	0.0000	0.0000	0.0000	0.0000	0.0000	846.3265	666.2570	682.8951	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7890	0.8439	0.8312	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	667.7489	562.2464	567.6109	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1138.4534	1103.6515	1072.8030	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	338.9073	402.8054	375.8629	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	84.7268	100.7013	93.9657	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												279.3939	(107)
Energy for space heating												30.2995	(99)
Energy for space cooling												3.3952	(108)
Total												33.6947	(109)
Fabric Energy Efficiency (DFEE)												33.7	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		82.2900	(1b)	x 2.5000	(2b) =	205.7250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.2900						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		205.7250	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1458	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3958	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3365	(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													

	0.4290	0.4206	0.4122	0.3701	0.3617	0.3196	0.3196	0.3112	0.3365	0.3617	0.3785	0.3953	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5920	0.5884	0.5849	0.5685	0.5654	0.5511	0.5511	0.5484	0.5566	0.5654	0.5716	0.5781	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			18.4700	1.1450	21.1489			(27)
External Wall	78.2400	18.4700	59.7700	0.1800	10.7586			(29a)
Communal Wall	19.7000	2.1000	17.6000	0.1800	3.1680			(29a)
External Roof	82.2900		82.2900	0.1100	9.0519			(30)
Total net area of external elements Aum(A, m2)			180.2300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2274			(33)
Party Wall			27.2000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 74.9516 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.3400	0.0500	0.5670
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	32.3700	0.0500	1.6185
E7 Party floor between dwellings (in blocks of flats)	33.7100	0.0700	2.3597
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.4600	0.0200	0.1092
E14 Flat roof	7.8800	0.0800	0.6304
E15 Flat roof with parapet	31.2900	0.5600	17.5224
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.8800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.8800	0.1200	1.3056

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.4628 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 71.6902 (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	40.1911	39.9486	39.7108	38.5941	38.3851	37.4125	37.4125	37.2324	37.7872	38.3851	38.8078	39.2497	(38)
Heat transfer coeff	111.8813	111.6387	111.4010	110.2842	110.0753	109.1027	109.1027	108.9225	109.4773	110.0753	110.4980	110.9399	(39)
Average = Sum(39)m / 12 =												110.2832	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3596	1.3566	1.3538	1.3402	1.3377	1.3258	1.3258	1.3236	1.3304	1.3377	1.3428	1.3482	(40)
HLP (average)												1.3402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5049 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.5992	28.1745	27.5764	26.4736	25.6478	24.7321	24.2375	24.8315	25.4781	26.4579	27.5835	28.5026	(42b)

Hot water usage for other uses

40.2824	38.8176	37.3528	35.8880	34.4232	32.9584	32.9584	34.4232	35.8880	37.3528	38.8176	40.2824	(42c)

Average daily hot water use (litres/day) 63.1364 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.8817	66.9921	64.9292	62.3616	60.0710	57.6905	57.1959	59.2546	61.3661	63.8107	66.4011	68.7850	(44)
Energy conte	109.0918	95.3959	99.7938	85.3699	80.8671	70.9372	69.1735	73.3696	75.6706	86.5906	94.6005	107.7007	(45)
Energy content (annual)										Total = Sum(45)m =		1048.5610	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	92.7280	81.0865	84.8247	72.5644	68.7370	60.2966	58.7974	62.3642	64.3200	73.6020	80.4105	91.5456	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	92.7280	81.0865	84.8247	72.5644	68.7370	60.2966	58.7974	62.3642	64.3200	73.6020	80.4105	91.5456	(64)
										Total per year (kWh/year) = Sum(64)m =		891.2768	(64)
12Total per year (kWh/year)												891	(64)

Electric shower(s)

53.0298	47.2500	51.5952	49.2366	50.1606	47.8483	49.4432	50.1606	49.2366	51.5952	50.6250	53.0298	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			603.2109	(64a)

Heat gains from water heating, kWh/month

36.4394	32.0841	34.1050	30.4503	29.7244	27.0362	27.0602	28.1312	28.3892	31.2993	32.7589	36.1438	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.0504	125.1629	113.0504	116.8187	113.0504	116.8187	113.0504	113.0504	116.8187	113.0504	116.8187	113.0504	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.1599	226.4860	220.6244	208.1456	192.3934	177.5886	167.6981	165.3720	171.2337	183.7124	199.4646	214.2694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	(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)	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	(71)
Water heating gains (Table 5)	48.9778	47.7442	45.8400	42.2920	39.9521	37.5503	36.3712	37.8107	39.4294	42.0689	45.4984	48.5804	(72)
Total internal gains	446.7612	459.9663	440.0879	427.8295	405.9691	392.5308	377.6928	376.8063	388.0549	399.4049	422.3549	436.4734	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4000	10.6334	0.6300	0.7000	0.7700	7.7993	(74)
South	16.0700	46.7521	0.6300	0.7000	0.7700	229.6088	(78)

Solar gains	237.4081	390.9449	504.3352	582.0649	618.9568	601.5893	585.2413	558.6136	530.8319	423.3367	281.7861	204.9050	(83)
Total gains	684.1693	850.9112	944.4232	1009.8945	1024.9259	994.1202	962.9342	935.4199	918.8869	822.7416	704.1410	641.3784	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.3133	15.3466	15.3793	15.5350	15.5645	15.7033	15.7033	15.7292	15.6495	15.5645	15.5050	15.4432	
alpha	2.0209	2.0231	2.0253	2.0357	2.0376	2.0469	2.0469	2.0486	2.0433	2.0376	2.0337	2.0295	
util living area	0.9126	0.8705	0.8255	0.7584	0.6704	0.5485	0.4302	0.4543	0.6038	0.7734	0.8776	0.9216	(86)
MIT	17.6570	18.1573	18.7494	19.4608	20.0878	20.5835	20.8209	20.7926	20.4551	19.6221	18.5173	17.5650	(87)
Th 2	19.7944	19.7967	19.7990	19.8095	19.8115	19.8207	19.8207	19.8224	19.8171	19.8115	19.8075	19.8033	(88)
util rest of house	0.9016	0.8550	0.8042	0.7272	0.6236	0.4771	0.3340	0.3598	0.5373	0.7379	0.8603	0.9117	(89)
MIT 2	16.7937	17.2799	17.8544	18.5405	19.1238	19.5614	19.7397	19.7236	19.4580	18.7088	17.6482	16.7095	(90)
Living area fraction										fLA = Living area / (4) =		0.3739	(91)
MIT	17.1165	17.6080	18.1891	18.8846	19.4843	19.9436	20.1440	20.1233	19.8308	19.0503	17.9732	17.0294	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1165	17.6080	18.1891	18.8846	19.4843	19.9436	20.1440	20.1233	19.8308	19.0503	17.9732	17.0294	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8688	0.8192	0.7694	0.6991	0.6092	0.4852	0.3620	0.3855	0.5382	0.7110	0.8259	0.8803	(94)
Useful gains	594.3755	697.0286	726.6304	706.0365	624.3900	482.3254	348.5482	360.5743	494.5392	584.9560	581.5826	564.6329	(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	1433.9242	1418.7060	1302.1739	1101.1467	856.8582	582.9992	386.6601	405.5564	627.3969	930.1720	1201.4635	1423.2910	(97)
Space heating kWh	624.6242	484.9672	428.2044	284.4793	172.9563	0.0000	0.0000	0.0000	0.0000	256.8407	446.3143	638.8416	(98a)
Space heating requirement - total per year (kWh/year)												3337.2281	
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	624.6242	484.9672	428.2044	284.4793	172.9563	0.0000	0.0000	0.0000	0.0000	256.8407	446.3143	638.8416	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3337.2281	
Space heating per m2											(98c) / (4) =	40.5545	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	0.0000	0.0000	0.0000	0.0000	0.0000	1025.5650	807.3597	827.8113	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7004	0.7644	0.7490	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	718.2998	617.1142	620.0266	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1118.2875	1084.0349	1054.0841	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	287.9911	347.3890	322.9387	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	71.9978	86.8472	80.7347	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												239.5797	(107)
Energy for space heating												40.5545	(99)
Energy for space cooling												2.9114	(108)
Total												43.4659	(109)
Fabric Energy Efficiency (TFEE)												43.5	(109)

Full SAP Calculation Printout

Property Reference	F4	**Issued on Date**	04/10/2024
Assessment Reference	F4_Copy	**Prop Type Ref**	F4
Property	F4		

SAP Rating	85 B	**DER**	2.04	**TER**	13.00
Environmental	98 A	**% DER < TER**			84.31
CO_2 Emissions (t/year)	0.18	**DFEE**	31.55	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			23.08
% DPER < TPER	70.49	**DPER**	20.46	**TPER**	69.32

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	106.0100	(1b)	x 2.5000	(2b) =	265.0250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.0100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	265.0250	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1509	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4009	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3408	(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	0.4345	0.4260	0.4175	0.3749	0.3663	0.3238	0.3238	0.3152	0.3408	0.3663	0.3834	0.4004	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5944	0.5907	0.5871	0.5703	0.5671	0.5524	0.5524	0.5497	0.5581	0.5671	0.5735	0.5802	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	96.1800	19.0000	77.1800	0.1500	11.5770	9.0000	694.6200	(29a)
Communal Wall	6.5700	2.1000	4.4700	0.1500	0.6705	9.0000	40.2300	(29a)
External Roof	106.0100		106.0100	0.1000	10.6010	9.0000	954.0900	(30)
Total net area of external elements Aum(A, m2)			208.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.7042			(33)
Party Wall			28.8900	0.0000	0.0000	20.0000	577.8000	(32)
Party Floor			106.0100			40.0000	4240.4000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7407.1400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		69.8721 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		10.4380 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.1422 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	51.9850	51.6644	51.3502	49.8742	49.5981	48.3126	48.3126	48.0745	48.8077	49.5981	50.1567	50.7408	(38)
Heat transfer coeff													
	109.1272	108.8067	108.4924	107.0165	106.7403	105.4548	105.4548	105.2167	105.9500	106.7403	107.2990	107.8830	(39)
Average = Sum(39)m / 12 =												107.0151	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0294	1.0264	1.0234	1.0095	1.0069	0.9948	0.9948	0.9925	0.9994	1.0069	1.0122	1.0177	(40)
HLP (average)												1.0095	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7886	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	30.6452	30.1901	29.5492	28.3675	27.4826	26.5014	25.9715	26.6079	27.3008	28.3507	29.5568	30.5416	(42b)
Hot water usage for other uses													
	43.1884	41.6179	40.0474	38.4769	36.9064	35.3360	35.3360	36.9064	38.4769	40.0474	41.6179	43.1884	(42c)
Average daily hot water use (litres/day)												67.6751	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	73.8336	71.8080	69.5966	66.8444	64.3891	61.8374	61.3074	63.5143	65.7778	68.3981	71.1747	73.7300	(44)
Energy conte	116.9344	102.2537	106.9674	91.5066	86.6800	76.0363	74.1460	78.6440	81.1106	92.8156	101.4014	115.4434	(45)
Energy content (annual)										Total = Sum(45)m =		1123.9395	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	99.3942	86.9156	90.9223	77.7806	73.6780	64.6308	63.0241	66.8474	68.9440	78.8933	86.1912	98.1269	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	99.3942	86.9156	90.9223	77.7806	73.6780	64.6308	63.0241	66.8474	68.9440	78.8933	86.1912	98.1269	(64)
										Total per year (kWh/year) = Sum(64)m =		955.3485	(64)
12Total per year (kWh/year)												955	(64)
Electric shower(s)													
	56.8400	50.6449	55.3023	52.7743	53.7646	51.2862	52.9957	53.7646	52.7743	55.3023	54.2624	56.8400	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		646.5512	(64a)
Heat gains from water heating, kWh/month													
	39.0586	34.3901	36.5561	32.6387	31.8606	28.9793	29.0050	30.1530	30.4296	33.5489	35.1134	38.7417	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	136.9684	151.6436	136.9684	141.5340	136.9684	141.5340	136.9684	136.9684	141.5340	136.9684	141.5340	136.9684	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	265.6938	268.4509	261.5032	246.7123	228.0414	210.4935	198.7704	196.0133	202.9610	217.7519	236.4228	253.9707	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	(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)													
	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	(71)
Water heating gains (Table 5)													
	52.4981	51.1758	49.1346	45.3316	42.8235	40.2490	38.9852	40.5282	42.2633	45.0926	48.7686	52.0722	(72)
Total internal gains													
	519.9898	536.0998	512.4357	498.4074	472.6628	457.1060	439.5534	438.3394	451.5878	464.6424	491.5549	507.8408	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	764.1979	938.2434	1031.2211	1097.1558	1109.3668	1075.9475	1041.5768	1012.9667	997.6312	900.1067	781.4123	718.6147	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	18.8545	18.9100	18.9648	19.2264	19.2761	19.5111	19.5111	19.5552	19.4199	19.2761	19.1758	19.0719	
alpha	2.2570	2.2607	2.2643	2.2818	2.2851	2.3007	2.3007	2.3037	2.2947	2.2851	2.2784	2.2715	
util living area													
	0.9132	0.8698	0.8230	0.7506	0.6561	0.5255	0.4042	0.4279	0.5831	0.7647	0.8759	0.9224	(86)
MIT	18.2159	18.6803	19.2017	19.8225	20.3377	20.7246	20.8918	20.8729	20.6253	19.9451	18.9866	18.1390	(87)
Th 2	20.0589	20.0614	20.0639	20.0754	20.0776	20.0877	20.0877	20.0896	20.0838	20.0776	20.0732	20.0686	(88)
util rest of house													
	0.9041	0.8568	0.8052	0.7247	0.6179	0.4693	0.3316	0.3562	0.5299	0.7351	0.8614	0.9142	(89)

MIT 2	17.5118	17.9648	18.4721	19.0741	19.5554	19.9023	20.0313	20.0205	19.8196	19.2024	18.2797	17.4430	(90)
Living area fraction										fLA = Living area / (4) =		0.3269	(91)
MIT	17.7419	18.1986	18.7106	19.3187	19.8111	20.1711	20.3126	20.2991	20.0829	19.4452	18.5107	17.6705	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7419	18.1986	18.7106	19.3187	19.8111	20.1711	20.3126	20.2991	20.0829	19.4452	18.5107	17.6705	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8751	0.8255	0.7750	0.7009	0.6059	0.4747	0.3502	0.3734	0.5299	0.7120	0.8312	0.8866	(94)
Useful gains	668.7575	774.4851	799.2146	768.9582	672.1294	510.8009	364.7282	378.2064	528.6283	640.8984	649.5404	637.1040	(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	1466.8827	1446.9812	1324.7582	1114.9702	865.7840	587.4974	391.5106	410.2518	633.8908	944.1341	1224.3592	1453.2384	(97)
Space heating kWh	593.8052	451.9174	391.0044	249.1287	144.0790	0.0000	0.0000	0.0000	0.0000	225.6074	413.8695	607.2040	(98a)
Space heating requirement - total per year (kWh/year)												3076.6155	
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	593.8052	451.9174	391.0044	249.1287	144.0790	0.0000	0.0000	0.0000	0.0000	225.6074	413.8695	607.2040	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3076.6155	
Space heating per m2											(98c) / (4) =	29.0219	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	0.0000	0.0000	0.0000	0.0000	0.0000	991.2750	780.3654	799.6471	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7604	0.8204	0.8069	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	753.8127	640.2387	645.2305	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1200.0169	1162.5635	1131.8528	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	321.2670	388.6096	362.0470	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	80.3167	97.1524	90.5118	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												267.9809	(107)
Energy for space heating												29.0219	(99)
Energy for space cooling												2.5279	(108)
Total												31.5498	(109)
Fabric Energy Efficiency (DFEE)												31.5	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	106.0100	(1b)	x 2.5000	(2b) =	265.0250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.0100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		265.0250	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1509	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4009	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3408	(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													

	0.4345	0.4260	0.4175	0.3749	0.3663	0.3238	0.3238	0.3152	0.3408	0.3663	0.3834	0.4004	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5944	0.5907	0.5871	0.5703	0.5671	0.5524	0.5524	0.5497	0.5581	0.5671	0.5735	0.5802	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	96.1800	19.0000	77.1800	0.1800	13.8924			(29a)
Communal Wall	6.5700	2.1000	4.4700	0.1800	0.8046			(29a)
External Roof	106.0100		106.0100	0.1100	11.6611			(30)
Total net area of external elements Aum(A, m2)			208.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.2138			(33)
Party Wall			28.8900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 69.8721 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	17.8000	0.0500	0.8900
E3	Sill	8.8500	0.0500	0.4425
E4	Jamb	51.6700	0.0500	2.5835
E7	Party floor between dwellings (in blocks of flats)	30.1800	0.0700	2.1126
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	10.9200	0.0200	0.2184
E14	Flat roof	2.6300	0.0800	0.2104
E15	Flat roof with parapet	38.4700	0.5600	21.5432
E16	Corner (normal)	10.0000	0.0900	0.9000
E18	Party wall between dwellings	7.5000	0.0600	0.4500
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5600	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	11.5600	0.1200	1.3872

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		30.7378	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	80.9516	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	51.9850	51.6644	51.3502	49.8742	49.5981	48.3126	48.3126	48.0745	48.8077	49.5981	50.1567	50.7408	(38)
Heat transfer coeff	132.9366	132.6161	132.3018	130.8259	130.5497	129.2642	129.2642	129.0261	129.7594	130.5497	131.1084	131.6924	(39)
Average = Sum(39)m / 12 =												130.8245	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2540	1.2510	1.2480	1.2341	1.2315	1.2194	1.2194	1.2171	1.2240	1.2315	1.2368	1.2423	(40)
HLP (average)												1.2341	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7886	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	30.6452	30.1901	29.5492	28.3675	27.4826	26.5014	25.9715	26.6079	27.3008	28.3507	29.5568	30.5416	(42b)
Hot water usage for other uses													
	43.1884	41.6179	40.0474	38.4769	36.9064	35.3360	35.3360	36.9064	38.4769	40.0474	41.6179	43.1884	(42c)
Average daily hot water use (litres/day)												67.6751	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	73.8336	71.8080	69.5966	66.8444	64.3891	61.8374	61.3074	63.5143	65.7778	68.3981	71.1747	73.7300	(44)
Energy conte	116.9344	102.2537	106.9674	91.5066	86.6800	76.0363	74.1460	78.6440	81.1106	92.8156	101.4014	115.4434	(45)
Energy content (annual)										Total = Sum(45)m =		1123.9395	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	99.3942	86.9156	90.9223	77.7806	73.6780	64.6308	63.0241	66.8474	68.9440	78.8933	86.1912	98.1269	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	99.3942	86.9156	90.9223	77.7806	73.6780	64.6308	63.0241	66.8474	68.9440	78.8933	86.1912	98.1269	(64)
										Total per year (kWh/year) = Sum(64)m =		955.3485	(64)
12Total per year (kWh/year)												955	(64)
Electric shower(s)													
	56.8400	50.6449	55.3023	52.7743	53.7646	51.2862	52.9957	53.7646	52.7743	55.3023	54.2624	56.8400	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		646.5512	(64a)
Heat gains from water heating, kWh/month													
	39.0586	34.3901	36.5561	32.6387	31.8606	28.9793	29.0050	30.1530	30.4296	33.5489	35.1134	38.7417	(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	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	136.9684	151.6436	136.9684	141.5340	136.9684	141.5340	136.9684	136.9684	141.5340	136.9684	141.5340	136.9684	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	265.6938	268.4509	261.5032	246.7123	228.0414	210.4935	198.7704	196.0133	202.9610	217.7519	236.4228	253.9707	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	(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)													
	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	(71)
Water heating gains (Table 5)													
	52.4981	51.1758	49.1346	45.3316	42.8235	40.2490	38.9852	40.5282	42.2633	45.0926	48.7686	52.0722	(72)
Total internal gains													
	519.9898	536.0998	512.4357	498.4074	472.6628	457.1060	439.5534	438.3394	451.5878	464.6424	491.5549	507.8408	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	764.1979	938.2434	1031.2211	1097.1558	1109.3668	1075.9475	1041.5768	1012.9667	997.6312	900.1067	781.4123	718.6147	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.4776	15.5150	15.5519	15.7273	15.7606	15.9173	15.9173	15.9467	15.8566	15.7606	15.6934	15.6238	
alpha	2.0318	2.0343	2.0368	2.0485	2.0507	2.0612	2.0612	2.0631	2.0571	2.0507	2.0462	2.0416	
util living area													
	0.9218	0.8853	0.8460	0.7848	0.7020	0.5818	0.4616	0.4860	0.6359	0.7970	0.8907	0.9297	(86)
MIT	17.5899	18.0612	18.6408	19.3621	20.0114	20.5407	20.7992	20.7687	20.4055	19.5458	18.4475	17.5084	(87)
Th 2	19.8770	19.8794	19.8818	19.8928	19.8949	19.9045	19.9045	19.9063	19.9008	19.8949	19.8907	19.8863	(88)
util rest of house													
	0.9125	0.8722	0.8278	0.7576	0.6599	0.5152	0.3689	0.3954	0.5748	0.7660	0.8760	0.9213	(89)
MIT 2	16.7868	17.2476	17.8138	18.5158	19.1279	19.6048	19.8065	19.7879	19.4924	18.7049	17.6417	16.7126	(90)
Living area fraction										fLA = Living area / (4) =		0.3269	(91)
MIT	17.0493	17.5136	18.0841	18.7925	19.4167	19.9107	20.1310	20.1085	19.7908	18.9797	17.9051	16.9727	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0493	17.5136	18.0841	18.7925	19.4167	19.9107	20.1310	20.1085	19.7908	18.9797	17.9051	16.9727	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8805	0.8362	0.7914	0.7256	0.6393	0.5156	0.3894	0.4134	0.5680	0.7351	0.8414	0.8909	(94)
Useful gains	672.8585	784.5996	816.1201	796.1108	709.2292	554.7941	405.5420	418.7549	566.6270	661.6922	657.4565	640.1979	(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													
	1694.8474	1672.7605	1532.5988	1294.1886	1007.4100	686.4812	456.4303	478.4873	738.4400	1093.9736	1416.6338	1682.0726	(97)
Space heating kWh													
	760.3597	596.8442	533.0602	358.6160	221.8465	0.0000	0.0000	0.0000	0.0000	321.6173	546.6076	775.1548	(98a)
Space heating requirement - total per year (kWh/year)												4114.1063	
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													
	760.3597	596.8442	533.0602	358.6160	221.8465	0.0000	0.0000	0.0000	0.0000	321.6173	546.6076	775.1548	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4114.1063	
Space heating per m2											(98c) / (4) =	38.8087	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
	0.0000	0.0000	0.0000	0.0000	0.0000	1215.0834	956.5550	980.5986	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6691	0.7363	0.7205	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	813.0319	704.3322	706.4740	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1200.0169	1162.5635	1131.8528	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	278.6292	340.9241	316.4818	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	69.6573	85.2310	79.1205	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												234.0088	(107)
Energy for space heating												38.8087	(99)
Energy for space cooling												2.2074	(108)
Total												41.0161	(109)
Fabric Energy Efficiency (TFEE)												41.0	(109)

Full SAP Calculation Printout

Property Reference	F5	**Issued on Date**	04/10/2024
Assessment Reference	F5_Copy	**Prop Type Ref**	F5
Property	F5		

SAP Rating	84 B	**DER**	2.41	**TER**	14.12
Environmental	98 A	**% DER < TER**			82.93
CO_2 Emissions (t/year)	0.19	**DFEE**	35.15	**TFEE**	43.03
Compliance Check	See BREL	**% DFEE < TFEE**			18.30
% DPER < TPER	67.79	**DPER**	24.29	**TPER**	75.41

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	89.8800	(1b)	x 2.5000	(2b) =	224.7000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.8800					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	224.7000	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1335	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3835	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3260	(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	0.4156	0.4075	0.3993	0.3586	0.3504	0.3097	0.3097	0.3015	0.3260	0.3504	0.3667	0.3830	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5864	0.5830	0.5797	0.5643	0.5614	0.5480	0.5480	0.5455	0.5531	0.5614	0.5672	0.5734	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			21.2600	1.1450	24.3435			(27)
External Wall	65.6400	21.2600	44.3800	0.1500	6.6570	9.0000	399.4200	(29a)
Communal Wall	38.0600	2.1000	35.9600	0.1500	5.3940	9.0000	323.6400	(29a)
External Roof	89.8800		89.8800	0.1000	8.9880	9.0000	808.9200	(30)
Total net area of external elements Aum(A, m2)			193.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.4825			(33)
Party Wall			28.5400	0.0000	0.0000	20.0000	570.8000	(32)
Party Floor			89.8800			40.0000	3595.2000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6597.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.4088 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		9.6790 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.1615 (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	43.4802	43.2315	42.9878	41.8427	41.6285	40.6312	40.6312	40.4465	41.0154	41.6285	42.0619	42.5150	(38)
Heat transfer coeff	100.6418	100.3930	100.1493	99.0042	98.7900	97.7927	97.7927	97.6081	98.1769	98.7900	99.2234	99.6765	(39)
Average = Sum(39)m / 12 =												99.0032	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1197	1.1170	1.1143	1.1015	1.0991	1.0880	1.0880	1.0860	1.0923	1.0991	1.1040	1.1090	(40)
HLP (average)												1.1015	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6241 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.4587	29.0212	28.4051	27.2691	26.4185	25.4754	24.9659	25.5777	26.2438	27.2530	28.4124	29.3591	(42b)
Hot water usage for other uses	41.5031	39.9939	38.4847	36.9755	35.4663	33.9571	33.9571	35.4663	36.9755	38.4847	39.9939	41.5031	(42c)
Average daily hot water use (litres/day)												65.0430	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.9619	69.0151	66.8898	64.2447	61.8849	59.4325	58.9230	61.0440	63.2193	65.7378	68.4063	70.8623	(44)
Energy conte	112.3862	98.2766	102.8072	87.9477	83.3089	73.0792	71.2623	75.5852	77.9558	89.2055	97.4574	110.9532	(45)
Energy content (annual)										Total = Sum(45)m =		1080.2252	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss: Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	95.5283	83.5351	87.3861	74.7556	70.8126	62.1173	60.5729	64.2474	66.2624	75.8247	82.8388	94.3102	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.5283	83.5351	87.3861	74.7556	70.8126	62.1173	60.5729	64.2474	66.2624	75.8247	82.8388	94.3102	(64)
								Total per year (kWh/year) = Sum(64)m =				918.1914	(64)
12Total per year (kWh/year)												918	(64)
Electric shower(s)	54.6303	48.6761	53.1524	50.7227	51.6745	49.2924	50.9355	51.6745	50.7227	53.1524	52.1529	54.6303	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							621.4168	(64a)
Heat gains from water heating, kWh/month	37.5397	33.0528	35.1346	31.3696	30.6218	27.8524	27.8771	28.9805	29.2463	32.2443	33.7479	37.2351	(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	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.4758	133.3839	120.4758	124.4917	120.4758	124.4917	120.4758	120.4758	124.4917	120.4758	124.4917	120.4758	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.8568	241.3354	235.0894	221.7925	205.0076	189.2321	178.6931	176.2145	182.4605	195.7574	212.5423	228.3178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	(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)	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	(71)
Water heating gains (Table 5)	50.4565	49.1857	47.2240	43.5688	41.1583	38.6839	37.4692	38.9523	40.6198	43.3391	46.8721	50.0472	(72)
Total internal gains	472.1503	486.2662	465.1503	452.2142	429.0028	414.7688	398.9993	398.0037	409.9331	421.9334	446.2672	461.2020	(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	
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)
Southwest	13.0100	36.7938	0.6300	0.7000	0.7700	146.2932	(79)
Northwest	4.9500	11.2829	0.6300	0.7000	0.7700	17.0687	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	210.5124	361.1556	501.9169	636.4358	727.2265	728.5795	699.6552	630.7166	548.2113	401.1587	252.5918	179.8780	(83)
Total gains	682.6626	847.4218	967.0672	1088.6499	1156.2293	1143.3483	1098.6545	1028.7203	958.1444	823.0921	698.8590	641.0800	(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	18.2109	18.2560	18.3004	18.5121	18.5522	18.7414	18.7414	18.7769	18.6681	18.5522	18.4712	18.3872	
alpha	2.2141	2.2171	2.2200	2.2341	2.2368	2.2494	2.2494	2.2518	2.2445	2.2368	2.2314	2.2258	
util living area	0.9145	0.8701	0.8144	0.7231	0.6087	0.4730	0.3613	0.3957	0.5661	0.7635	0.8782	0.9237	(86)
MIT	18.1107	18.5931	19.1782	19.8681	20.4069	20.7643	20.9075	20.8836	20.6266	19.8994	18.8927	18.0264	(87)
Th 2	19.9847	19.9870	19.9892	19.9996	20.0015	20.0106	20.0106	20.0123	20.0071	20.0015	19.9976	19.9935	(88)

util rest of house

	0.9049	0.8562	0.7948	0.6940	0.5668	0.4149	0.2888	0.3219	0.5090	0.7316	0.8629	0.9151	(89)
MIT 2	17.3569	17.8265	18.3929	19.0533	19.5470	19.8590	19.9656	19.9528	19.7518	19.1006	18.1346	17.2802	(90)
Living area fraction										fLA = Living area / (4) =		0.3858	(91)
MIT	17.6477	18.1223	18.6959	19.3677	19.8788	20.2083	20.3290	20.3120	20.0893	19.4088	18.4271	17.5681	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6477	18.1223	18.6959	19.3677	19.8788	20.2083	20.3290	20.3120	20.0893	19.4088	18.4271	17.5681	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8760	0.8250	0.7654	0.6736	0.5613	0.4270	0.3128	0.3451	0.5140	0.7101	0.8330	0.8876	(94)
Useful gains	598.0452	699.1272	740.1636	733.3455	648.9618	488.2493	343.7039	354.9937	492.4996	584.4465	582.1754	569.0033	(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													
	1343.3407	1327.4276	1221.4095	1036.3484	807.9816	548.4508	364.6730	381.8381	588.0156	870.2237	1123.9121	1332.4874	(97)
Space heating kWh													
	554.4998	422.2179	358.0469	218.1621	118.3108	0.0000	0.0000	0.0000	0.0000	212.6182	390.0504	568.0322	(98a)
Space heating requirement - total per year (kWh/year)												2841.9383	
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													
	554.4998	422.2179	358.0469	218.1621	118.3108	0.0000	0.0000	0.0000	0.0000	212.6182	390.0504	568.0322	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2841.9383	
Space heating per m2											(98c) / (4) =	31.6193	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
	0.0000	0.0000	0.0000	0.0000	0.0000	919.2517	723.6663	741.8212	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7989	0.8498	0.8281	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	734.3680	614.9528	614.2671	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1289.0974	1239.1943	1159.8155	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	399.4052	464.4356	405.8880	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	99.8513	116.1089	101.4720	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												317.4322	(107)
Energy for space heating												31.6193	(99)
Energy for space cooling												3.5317	(108)
Total												35.1510	(109)
Fabric Energy Efficiency (DFEE)												35.2	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		89.8800	(1b)	x 2.5000	(2b) =	224.7000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.8800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		224.7000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1335	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3835	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3260	(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												
	0.4156	0.4075	0.3993	0.3586	0.3504	0.3097	0.3097	0.3015	0.3260	0.3504	0.3667	0.3830 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5864	0.5830	0.5797	0.5643	0.5614	0.5480	0.5480	0.5455	0.5531	0.5614	0.5672	0.5734 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.3700	1.1450	23.3244			(27)
External Wall	65.6400	20.3700	45.2700	0.1800	8.1486			(29a)
Communal Wall	38.0600	2.1000	35.9600	0.1800	6.4728			(29a)
External Roof	89.8800		89.8800	0.1100	9.8868			(30)
Total net area of external elements Aum(A, m2)			193.5800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.9326			(33)
Party Wall			28.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	73.4088	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.8500	0.0500	0.6425
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	35.6500	0.0500	1.7825
E7 Party floor between dwellings (in blocks of flats)	34.7700	0.0700	2.4339
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7000	0.0200	0.1340
E14 Flat roof	15.2200	0.0800	1.2176
E15 Flat roof with parapet	26.2400	0.5600	14.6944
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4200	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	11.4200	0.1200	1.3704
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	23.8003	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	73.7329	(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	43.4802	43.2315	42.9878	41.8427	41.6285	40.6312	40.6312	40.4465	41.0154	41.6285	42.0619	42.5150	(38)
Heat transfer coeff	117.2132	116.9645	116.7207	115.5757	115.3614	114.3642	114.3642	114.1795	114.7483	115.3614	115.7948	116.2479	(39)
Average = Sum(39)m / 12 =												115.5746	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3041	1.3013	1.2986	1.2859	1.2835	1.2724	1.2724	1.2704	1.2767	1.2835	1.2883	1.2934	(40)
HLP (average)												1.2859	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6241	(42)

Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.4587	29.0212	28.4051	27.2691	26.4185	25.4754	24.9659	25.5777	26.2438	27.2530	28.4124	29.3591	(42b)
Hot water usage for other uses													
	41.5031	39.9939	38.4847	36.9755	35.4663	33.9571	33.9571	35.4663	36.9755	38.4847	39.9939	41.5031	(42c)
Average daily hot water use (litres/day)												65.0430	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.9619	69.0151	66.8898	64.2447	61.8849	59.4325	58.9230	61.0440	63.2193	65.7378	68.4063	70.8623	(44)
Energy conte	112.3862	98.2766	102.8072	87.9477	83.3089	73.0792	71.2623	75.5852	77.9558	89.2055	97.4574	110.9532	(45)
Energy content (annual)										Total = Sum(45)m =		1080.2252	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	95.5283	83.5351	87.3861	74.7556	70.8126	62.1173	60.5729	64.2474	66.2624	75.8247	82.8388	94.3102	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	95.5283	83.5351	87.3861	74.7556	70.8126	62.1173	60.5729	64.2474	66.2624	75.8247	82.8388	94.3102	(64)
										Total per year (kWh/year) = Sum(64)m =		918.1914	(64)
12Total per year (kWh/year)												918	(64)
Electric shower(s)													
	54.6303	48.6761	53.1524	50.7227	51.6745	49.2924	50.9355	51.6745	50.7227	53.1524	52.1529	54.6303	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		621.4168	(64a)
Heat gains from water heating, kWh/month													
	37.5397	33.0528	35.1346	31.3696	30.6218	27.8524	27.8771	28.9805	29.2463	32.2443	33.7479	37.2351	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	120.4521	133.3577	120.4521	124.4672	120.4521	124.4672	120.4521	120.4521	124.4672	120.4521	124.4672	120.4521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	238.8568	241.3354	235.0894	221.7925	205.0076	189.2321	178.6931	176.2145	182.4605	195.7574	212.5423	228.3178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	(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)													
	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	(71)
Water heating gains (Table 5)													
	50.4565	49.1857	47.2240	43.5688	41.1583	38.6839	37.4692	38.9523	40.6198	43.3391	46.8721	50.0472	(72)
Total internal gains													
	472.1266	486.2399	465.1266	452.1897	428.9791	414.7443	398.9756	397.9800	409.9086	421.9097	446.2428	461.1783	(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	
South	3.1600	46.7521	0.6300	0.7000	0.7700	45.1502	(78)
Southwest	12.4700	36.7938	0.6300	0.7000	0.7700	140.2211	(79)
Northwest	4.7400	11.2829	0.6300	0.7000	0.7700	16.3445	(81)

Solar gains	201.7158	346.0625	480.9363	609.8232	696.8087	698.1011	670.3885	604.3398	525.2927	384.3926	242.0366	172.3617	(83)
Total gains	673.8424	832.3025	946.0630	1062.0128	1125.7878	1112.8455	1069.3641	1002.3198	935.2013	806.3023	688.2793	633.5400	(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	15.6362	15.6695	15.7022	15.8578	15.8872	16.0258	16.0258	16.0517	15.9721	15.8872	15.8278	15.7661	
alpha	2.0424	2.0446	2.0468	2.0572	2.0591	2.0684	2.0684	2.0701	2.0648	2.0591	2.0552	2.0511	
util living area													
	0.9227	0.8853	0.8384	0.7599	0.6568	0.5269	0.4124	0.4481	0.6162	0.7943	0.8921	0.9306	(86)
MIT	17.6083	18.0862	18.7117	19.4874	20.1464	20.6258	20.8401	20.8043	20.4470	19.5683	18.4563	17.5235	(87)
Th 2	19.8376	19.8398	19.8419	19.8519	19.8538	19.8625	19.8625	19.8641	19.8591	19.8538	19.8500	19.8460	(88)
util rest of house													
	0.9131	0.8716	0.8188	0.7298	0.6111	0.4587	0.3221	0.3576	0.5521	0.7617	0.8768	0.9220	(89)
MIT 2	16.7755	17.2420	17.8503	18.5970	19.2069	19.6276	19.7888	19.7687	19.4882	18.6933	17.6197	16.6975	(90)
Living area fraction										fLA = Living area / (4) =		0.3858	(91)
MIT	17.0968	17.5677	18.1827	18.9406	19.5694	20.0128	20.1945	20.1683	19.8582	19.0309	17.9425	17.0162	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0968	17.5677	18.1827	18.9406	19.5694	20.0128	20.1945	20.1683	19.8582	19.0309	17.9425	17.0162	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8822	0.8371	0.7843	0.7022	0.5985	0.4683	0.3498	0.3833	0.5521	0.7338	0.8437	0.8926	(94)
Useful gains	594.4878	696.7022	741.9923	745.7658	673.8289	521.1967	374.0825	384.1823	516.2887	591.6431	580.7350	565.5004	(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													
	1499.9570	1481.6741	1363.6091	1160.4458	907.8237	619.0251	411.0797	430.2629	660.7407	972.6018	1255.5082	1489.8567	(97)
Space heating kWh													
	673.6691	527.5011	462.4829	298.5696	174.0921	0.0000	0.0000	0.0000	0.0000	283.4333	485.8366	687.7211	(98a)
Space heating requirement - total per year (kWh/year)												3593.3059	
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													
	673.6691	527.5011	462.4829	298.5696	174.0921	0.0000	0.0000	0.0000	0.0000	283.4333	485.8366	687.7211	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3593.3059	
Space heating per m2											(98c) / (4) =	39.9789	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
	0.0000	0.0000	0.0000	0.0000	0.0000	1075.0231	846.2947	867.7640	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7242	0.7834	0.7579	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	778.5762	663.0234	657.6475	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1253.4714	1204.9842	1128.9826	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	341.9245	403.2188	350.6733	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	85.4811	100.8047	87.6683	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												273.9542	(107)
Energy for space heating												39.9789	(99)
Energy for space cooling												3.0480	(108)
Total												43.0269	(109)
Fabric Energy Efficiency (TFEE)												43.0	(109)

Full SAP Calculation Printout

Property Reference	F6	**Issued on Date**	04/10/2024
Assessment Reference	F6_Copy	**Prop Type Ref**	F6
Property	F6		

SAP Rating	83 B	**DER**	2.53	**TER**	15.04
Environmental	98 A	**% DER < TER**			83.18
CO_2 Emissions (t/year)	0.21	**DFEE**	38.82	**TFEE**	48.70
Compliance Check	See BREL	**% DFEE < TFEE**			20.30
% DPER < TPER	68.18	**DPER**	25.56	**TPER**	80.33

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	95.3800	(1b)	x 2.5000	(2b) =	238.4500	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3800					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	238.4500	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1258	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3758	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3194	(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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3194	0.3434	0.3594	0.3753	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			22.8600	1.1450	26.1756			(27)
External Wall	97.4200	24.9600	72.4600	0.1500	10.8690	9.0000	652.1400	(29a)
Communal Wall	18.9000		18.9000	0.1500	2.8350	9.0000	170.1000	(29a)
External Roof	95.3500		95.3500	0.1000	9.5350	9.0000	858.1500	(30)
Total net area of external elements Aum(A, m2)			211.6700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.5146			(33)
Party Wall			16.1500	0.0000	0.0000	20.0000	323.0000	(32)
Party Floor			95.3500			40.0000	3814.0000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6717.3900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.4277 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		10.5835 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	62.0981 (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	45.8708	45.6173	45.3689	44.2021	43.9838	42.9676	42.9676	42.7794	43.3590	43.9838	44.4255	44.8872	(38)
Heat transfer coeff													
	107.9688	107.7154	107.4670	106.3002	106.0819	105.0657	105.0657	104.8775	105.4571	106.0819	106.5235	106.9852	(39)
Average = Sum(39)m / 12 =												106.2992	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1320	1.1293	1.1267	1.1145	1.1122	1.1015	1.1015	1.0996	1.1057	1.1122	1.1168	1.1217	(40)
HLP (average)												1.1145	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6924	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.9517	29.5068	28.8804	27.7255	26.8606	25.9017	25.3837	26.0057	26.6830	27.7091	28.8879	29.8504	(42b)
Hot water usage for other uses													
	42.2033	40.6687	39.1340	37.5993	36.0647	34.5300	34.5300	36.0647	37.5993	39.1340	40.6687	42.2033	(42c)
Average daily hot water use (litres/day)												66.1366	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	72.1550	70.1755	68.0144	65.3248	62.9253	60.4317	59.9137	62.0704	64.2823	66.8431	69.5565	72.0537	(44)
Energy conte	114.2759	99.9290	104.5356	89.4264	84.7095	74.3078	72.4604	76.8561	79.2665	90.7054	99.0960	112.8187	(45)
Energy content (annual)										Total = Sum(45)m =		1098.3873	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	97.1345	84.9396	88.8553	76.0124	72.0031	63.1616	61.5913	65.3277	67.3765	77.0996	84.2316	95.8959	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	97.1345	84.9396	88.8553	76.0124	72.0031	63.1616	61.5913	65.3277	67.3765	77.0996	84.2316	95.8959	(64)
										Total per year (kWh/year) = Sum(64)m =		933.6292	(64)
12Total per year (kWh/year)												934	(64)
Electric shower(s)													
	55.5484	49.4941	54.0456	51.5751	52.5429	50.1208	51.7915	52.5429	51.5751	54.0456	53.0293	55.5484	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						631.8595	(64a)
Heat gains from water heating, kWh/month													
	38.1707	33.6084	35.7252	31.8969	31.1365	28.3206	28.3457	29.4676	29.7379	32.7863	34.3152	37.8611	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	125.4080	138.8445	125.4080	129.5882	125.4080	129.5882	125.4080	125.4080	129.5882	125.4080	129.5882	125.4080	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	248.6353	251.2154	244.7137	230.8724	213.4003	196.9790	186.0086	183.4285	189.9302	203.7714	221.2435	237.6649	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	(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)													
	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	(71)
Water heating gains (Table 5)													
	51.3047	50.0125	48.0178	44.3012	41.8501	39.3342	38.0991	39.6070	41.3026	44.0676	47.6601	50.8885	(72)
Total internal gains													
	488.7347	503.4591	481.5261	468.1485	444.0451	429.2881	412.9022	411.8302	424.2077	436.6337	461.8785	477.3480	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.1000	11.2829	0.6300	0.7000	0.7700	21.0341	(75)
Southeast	3.3800	36.7938	0.6300	0.7000	0.7700	38.0070	(77)
Northwest	13.3800	11.2829	0.6300	0.7000	0.7700	46.1371	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	105.1782	201.4689	334.9221	514.3194	666.7486	701.8089	660.0217	540.2054	396.0851	238.6450	130.0424	87.3815	(83)
Total gains	593.9128	704.9280	816.4482	982.4679	1110.7937	1131.0970	1072.9239	952.0355	820.2928	675.2787	591.9209	564.7295	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.2822	17.3229	17.3629	17.5535	17.5896	17.7598	17.7598	17.7916	17.6938	17.5896	17.5167	17.4411	
alpha	2.1521	2.1549	2.1575	2.1702	2.1726	2.1840	2.1840	2.1861	2.1796	2.1726	2.1678	2.1627	
util living area													
	0.9366	0.9094	0.8643	0.7708	0.6434	0.4988	0.3890	0.4429	0.6436	0.8308	0.9130	0.9424	(86)
MIT	17.7328	18.1321	18.7608	19.6036	20.2814	20.7126	20.8808	20.8384	20.4706	19.5671	18.5201	17.6701	(87)
Th 2	19.9748	19.9770	19.9791	19.9890	19.9909	19.9996	19.9996	20.0012	19.9962	19.9909	19.9871	19.9832	(88)
util rest of house													

	0.9292	0.8990	0.8486	0.7443	0.6021	0.4392	0.3122	0.3632	0.5868	0.8047	0.9013	0.9357	(89)
MIT 2	16.9861	17.3790	17.9942	18.8076	19.4339	19.8124	19.9405	19.9165	19.6239	18.7943	17.7735	16.9296	(90)
Living area fraction										fLA = Living area / (4) =		0.3710	(91)
MIT	17.2631	17.6585	18.2786	19.1030	19.7484	20.1465	20.2894	20.2586	19.9381	19.0810	18.0505	17.2044	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2631	17.6585	18.2786	19.1030	19.7484	20.1465	20.2894	20.2586	19.9381	19.0810	18.0505	17.2044	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9025	0.8684	0.8161	0.7177	0.5913	0.4484	0.3353	0.3848	0.5832	0.7762	0.8719	0.9103	(94)
Useful gains	535.9935	612.1760	666.3208	705.1173	656.7749	507.2272	359.7425	366.3143	478.3625	524.1678	516.0796	514.0703	(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													
	1399.6138	1374.2834	1265.8159	1084.5793	853.7855	582.7418	387.6289	404.6771	615.6701	899.6831	1166.4875	1391.2761	(97)
Space heating kWh													
	642.5335	512.1362	446.0244	273.2127	146.5759	0.0000	0.0000	0.0000	0.0000	279.3834	468.2937	652.6411	(98a)
Space heating requirement - total per year (kWh/year)												3420.8007	
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													
	642.5335	512.1362	446.0244	273.2127	146.5759	0.0000	0.0000	0.0000	0.0000	279.3834	468.2937	652.6411	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3420.8007	
Space heating per m2											(98c) / (4) =	35.8650	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
	0.0000	0.0000	0.0000	0.0000	0.0000	987.6172	777.4859	797.0687	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7675	0.8192	0.7793	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	758.0271	636.9323	621.1456	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1272.2975	1206.7301	1067.8972	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	370.2747	423.9296	332.3832	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	92.5687	105.9824	83.0958	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												281.6469	(107)
Energy for space heating												35.8650	(99)
Energy for space cooling												2.9529	(108)
Total												38.8179	(109)
Fabric Energy Efficiency (DFEE)												38.8	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		95.3800	(1b)	x 2.5000	(2b) =	238.4500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		238.4500	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1258	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3758	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3194	(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													
	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3194	0.3434	0.3594	0.3753	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			21.7500	1.1450	24.9046			(27)
External Wall	97.4200	23.8500	73.5700	0.1800	13.2426			(29a)
Communal Wall	18.9000		18.9000	0.1800	3.4020			(29a)
External Roof	95.3500		95.3500	0.1100	10.4885			(30)
Total net area of external elements Aum(A, m2)			211.6700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.1377			(33)
Party Wall			16.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	70.4277	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	13.7700	0.0500	0.6885
E3	Sill	8.7500	0.0500	0.4375
E4	Jamb	42.2300	0.0500	2.1115
E7	Party floor between dwellings (in blocks of flats)	37.4000	0.0700	2.6180
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	9.1200	0.0200	0.1824
E14	Flat roof	7.5600	0.0800	0.6048
E15	Flat roof with parapet	38.9600	0.5600	21.8176
E16	Corner (normal)	17.5000	0.0900	1.5750
E18	Party wall between dwellings	5.0000	0.0600	0.3000
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	6.4600	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	6.4600	0.1200	0.7752
E17	Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	30.4355	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	84.5732	(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	45.8708	45.6173	45.3689	44.2021	43.9838	42.9676	42.9676	42.7794	43.3590	43.9838	44.4255	44.8872	(38)
Heat transfer coeff	130.4440	130.1905	129.9421	128.7753	128.5570	127.5408	127.5408	127.3526	127.9322	128.5570	128.9986	129.4603	(39)
Average = Sum(39)m / 12 =												128.7743	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3676	1.3650	1.3624	1.3501	1.3478	1.3372	1.3372	1.3352	1.3413	1.3478	1.3525	1.3573	(40)
HLP (average)												1.3501	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6924	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.9517	29.5068	28.8804	27.7255	26.8606	25.9017	25.3837	26.0057	26.6830	27.7091	28.8879	29.8504	(42b)
Hot water usage for other uses													
	42.2033	40.6687	39.1340	37.5993	36.0647	34.5300	34.5300	36.0647	37.5993	39.1340	40.6687	42.2033	(42c)
Average daily hot water use (litres/day)												66.1366	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	72.1550	70.1755	68.0144	65.3248	62.9253	60.4317	59.9137	62.0704	64.2823	66.8431	69.5565	72.0537	(44)
Energy conte	114.2759	99.9290	104.5356	89.4264	84.7095	74.3078	72.4604	76.8561	79.2665	90.7054	99.0960	112.8187	(45)
Energy content (annual)										Total = Sum(45)m =		1098.3873	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
	97.1345	84.9396	88.8553	76.0124	72.0031	63.1616	61.5913	65.3277	67.3765	77.0996	84.2316	95.8959	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	97.1345	84.9396	88.8553	76.0124	72.0031	63.1616	61.5913	65.3277	67.3765	77.0996	84.2316	95.8959	(64)
										Total per year (kWh/year) = Sum(64)m =		933.6292	(64)
12Total per year (kWh/year)												934	(64)
Electric shower(s)													
	55.5484	49.4941	54.0456	51.5751	52.5429	50.1208	51.7915	52.5429	51.5751	54.0456	53.0293	55.5484	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		631.8595	(64a)
Heat gains from water heating, kWh/month													
	38.1707	33.6084	35.7252	31.8969	31.1365	28.3206	28.3457	29.4676	29.7379	32.7863	34.3152	37.8611	(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	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	125.3824	138.8162	125.3824	129.5618	125.3824	129.5618	125.3824	125.3824	129.5618	125.3824	129.5618	125.3824	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	248.6353	251.2154	244.7137	230.8724	213.4003	196.9790	186.0086	183.4285	189.9302	203.7714	221.2435	237.6649	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	(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)													
	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	(71)
Water heating gains (Table 5)													
	51.3047	50.0125	48.0178	44.3012	41.8501	39.3342	38.0991	39.6070	41.3026	44.0676	47.6601	50.8885	(72)
Total internal gains													
	488.7091	503.4308	481.5006	468.1221	444.0195	429.2617	412.8767	411.8046	424.1813	436.6081	461.8521	477.3225	(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	5.8000	11.2829	0.6300	0.7000	0.7700	19.9996	(75)
Southeast	3.2200	36.7938	0.6300	0.7000	0.7700	36.2078	(77)
Northwest	12.7300	11.2829	0.6300	0.7000	0.7700	43.8958	(81)

Solar gains	100.1032	191.7363	318.7153	489.3941	634.4085	667.7577	628.0021	514.0149	376.9060	227.1092	123.7656	83.1666	(83)
Total gains	588.8123	695.1671	800.2159	957.5162	1078.4281	1097.0194	1040.8788	925.8195	801.0873	663.7173	585.6177	560.4890	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	14.3045	14.3324	14.3598	14.4899	14.5145	14.6302	14.6302	14.6518	14.5854	14.5145	14.4648	14.4132	
alpha	1.9536	1.9555	1.9573	1.9660	1.9676	1.9753	1.9753	1.9768	1.9724	1.9676	1.9643	1.9609	
util living area	0.9421	0.9197	0.8831	0.8063	0.6966	0.5625	0.4519	0.5064	0.6952	0.8549	0.9224	0.9471	(86)
MIT	17.1384	17.5317	18.1935	19.1170	19.9346	20.5205	20.7814	20.7180	20.2168	19.1549	18.0018	17.0733	(87)
Th 2	19.7882	19.7903	19.7923	19.8018	19.8035	19.8118	19.8118	19.8134	19.8086	19.8035	19.8000	19.7962	(88)
util rest of house	0.9346	0.9093	0.8673	0.7792	0.6515	0.4914	0.3532	0.4071	0.6325	0.8284	0.9106	0.9401	(89)
MIT 2	16.2919	16.6797	17.3298	18.2261	18.9904	19.5092	19.7107	19.6740	19.2710	18.2850	17.1556	16.2325	(90)
Living area fraction										fLA = Living area / (4) =		0.3710	(91)
MIT	16.6060	16.9958	17.6503	18.5567	19.3407	19.8844	20.1080	20.0614	19.6219	18.6078	17.4696	16.5445	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.6060	16.9958	17.6503	18.5567	19.3407	19.8844	20.1080	20.0614	19.6219	18.6078	17.4696	16.5445	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9059	0.8761	0.8307	0.7449	0.6316	0.4961	0.3795	0.4296	0.6211	0.7943	0.8785	0.9129	(94)
Useful gains	533.3962	609.0094	664.7184	713.2819	681.1881	544.2428	395.0413	397.7366	497.5614	527.1854	514.4804	511.6588	(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	1605.2412	1574.7632	1448.8878	1243.5398	982.2711	673.9797	447.4117	466.2837	706.4298	1029.4548	1337.6635	1598.1167	(97)
Space heating kWh	797.4527	648.9866	583.4221	381.7857	224.0058	0.0000	0.0000	0.0000	0.0000	373.6884	592.6919	808.3247	(98a)
Space heating requirement - total per year (kWh/year)												4410.3578	
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	797.4527	648.9866	583.4221	381.7857	224.0058	0.0000	0.0000	0.0000	0.0000	373.6884	592.6919	808.3247	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4410.3578	
Space heating per m2											(98c) / (4) =	46.2399	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	0.0000	0.0000	0.0000	0.0000	0.0000	1198.8832	943.8017	967.8796	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6730	0.7320	0.6868	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	806.8970	690.9030	664.7240	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1232.4952	1169.3022	1037.2818	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	306.4307	355.9290	277.1830	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	76.6077	88.9822	69.2958	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												234.8857	(107)
Energy for space heating												46.2399	(99)
Energy for space cooling												2.4626	(108)
Total												48.7025	(109)
Fabric Energy Efficiency (TFEE)												48.7	(109)

Full SAP Calculation Printout

Property Reference	F1	**Issued on Date**	04/10/2024
Assessment Reference	F1_Copy	**Prop Type Ref**	F1
Property	F1		

SAP Rating	83 B	**DER**	2.65	**TER**	15.78
Environmental	98 A	**% DER < TER**			83.21
CO_2 Emissions (t/year)	0.21	**DFEE**	40.63	**TFEE**	50.87
Compliance Check	See BREL	**% DFEE < TFEE**			20.12
% DPER < TPER	68.29	**DPER**	26.74	**TPER**	84.33

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		90.4500 (1b)	x	2.5000 (2b)	=	226.1250	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.4500						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	226.1250	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.0884 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3384 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2877 (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	0.3668	0.3596	0.3524	0.3164	0.3093	0.2733	0.2733	0.2661	0.2877	0.3093	0.3236	0.3380	(22b)
Effective ac	0.5673	0.5647	0.5621	0.5501	0.5478	0.5373	0.5373	0.5354	0.5414	0.5478	0.5524	0.5571	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			22.5500	1.1450	25.8206			(27)
External Wall	92.0500	22.5500	69.5000	0.1500	10.4250	9.0000	625.5000	(29a)
Communal Wall	39.6500	2.1000	37.5500	0.1500	5.6325	9.0000	337.9500	(29a)
External Roof	90.4500		90.4500	0.1000	9.0450	9.0000	814.0500	(30)
Total net area of external elements Aum(A, m2)			222.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.0231			(33)
Party Wall			18.8500	0.0000	0.0000	20.0000	377.0000	(32)
Party Floor			90.4500			40.0000	3618.0000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6672.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.7700 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		11.1075 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	64.1306 (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	42.3302	42.1353	41.9443	41.0469	40.8790	40.0974	40.0974	39.9526	40.3984	40.8790	41.2186	41.5737	(38)

Heat transfer coeff

	106.4609	106.2659	106.0749	105.1775	105.0096	104.2280	104.2280	104.0832	104.5290	105.0096	105.3492	105.7043 (39)
Average = Sum(39)m / 12 =												105.1767

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1770	1.1749	1.1727	1.1628	1.1610	1.1523	1.1523	1.1507	1.1557	1.1610	1.1647	1.1686	(40)
HLP (average)												1.1628	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6318	(42)
Hot water usage for mixer showers													
	93.9770	92.5647	90.5067	86.5691	83.6633	80.4227	78.5808	80.6232	82.8620	86.3414	90.3636	93.6169	(42a)
Hot water usage for baths													
	29.5146	29.0763	28.4590	27.3209	26.4687	25.5237	25.0133	25.6262	26.2936	27.3048	28.4663	29.4148	(42b)
Hot water usage for other uses													
	41.5826	40.0705	38.5584	37.0463	35.5342	34.0221	34.0221	35.5342	37.0463	38.5584	40.0705	41.5826	(42c)
Average daily hot water use (litres/day)												151.8107	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	165.0742	161.7115	157.5241	150.9363	145.6662	139.9685	137.6162	141.7836	146.2020	152.2046	158.9004	164.6143	(44)
Energy conte	261.4371	230.2750	242.1087	206.6243	196.0946	172.1076	166.4348	175.5577	180.2816	206.5402	226.3828	257.7463	(45)
Energy content (annual)											Total = Sum(45)m =	2521.5907	
Distribution loss (46)m = 0.15 x (45)m													
	39.2156	34.5412	36.3163	30.9936	29.4142	25.8161	24.9652	26.3337	27.0422	30.9810	33.9574	38.6619	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2200	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.7316	(55)
Total storage loss													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)
If cylinder contains dedicated solar storage													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	369.9743	328.3086	350.6459	311.6603	304.6318	246.5676	243.3768	252.4997	254.7416	315.0774	331.4188	366.2835	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	369.9743	328.3086	350.6459	311.6603	304.6318	246.5676	243.3768	252.4997	254.7416	315.0774	331.4188	366.2835	(64)
										Total per year (kWh/year) = Sum(64)m =		3675.1863	(64)
12Total per year (kWh/year)												3675	(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													
	130.8139	116.2055	124.3872	111.1730	109.0875	75.2354	73.9495	76.9829	77.9532	112.5607	117.7427	129.5867	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	121.0036	133.9683	121.0036	125.0371	121.0036	125.0371	121.0036	121.0036	125.0371	121.0036	125.0371	121.0036	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.9032	242.3926	236.1193	222.7642	205.9057	190.0611	179.4759	176.9865	183.2598	196.6149	213.4734	229.3180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	(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)													
	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	(71)
Water heating gains (Table 5)													
	175.8252	172.9248	167.1871	154.4069	146.6231	104.4936	99.3945	103.4716	108.2684	151.2913	163.5315	174.1757	(72)
Total internal gains													
	599.2094	611.7631	586.7875	564.6856	536.0098	482.0692	462.3514	463.9391	479.0427	531.3872	564.5194	586.9748	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.1200	10.6334	0.6300	0.7000	0.7700	13.3888	(74)
East	5.1100	19.6403	0.6300	0.7000	0.7700	30.6719	(76)
West	13.3200	19.6403	0.6300	0.7000	0.7700	79.9509	(80)

Solar gains	124.0115	241.9882	399.8605	589.5995	731.0652	752.7830	714.8257	607.8553	466.7623	287.2363	154.4504	102.1323	(83)
Total gains	723.2209	853.7514	986.6480	1154.2850	1267.0750	1234.8522	1177.1771	1071.7944	945.8049	818.6235	718.9698	689.1071	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.4099	17.4418	17.4732	17.6223	17.6505	17.7829	17.7829	17.8076	17.7316	17.6505	17.5936	17.5345	
alpha	2.1607	2.1628	2.1649	2.1748	2.1767	2.1855	2.1855	2.1872	2.1821	2.1767	2.1729	2.1690	
util living area													
	0.9098	0.8747	0.8183	0.7178	0.5926	0.4650	0.3577	0.4008	0.5892	0.7770	0.8788	0.9174	(86)
Living	18.0350	18.4453	19.0621	19.8173	20.3985	20.7515	20.8996	20.8682	20.5620	19.7848	18.7849	17.9618	

Non living	17.2529	17.6525	18.2493	18.9678	19.4960	19.8014	19.9109	19.8938	19.6579	18.9597	17.9978	17.1857	
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	19.4832	18.4453	19.0621	19.8173	20.3985	20.7515	20.8996	20.8682	20.5620	19.7848	18.7849	18.3868	(87)
Th 2	19.9384	19.9402	19.9419	19.9499	19.9514	19.9583	19.9583	19.9596	19.9556	19.9514	19.9483	19.9452	(88)
util rest of house	0.8994	0.8608	0.7983	0.6874	0.5490	0.4047	0.2823	0.3227	0.5293	0.7450	0.8630	0.9078	(89)
MIT 2	18.5646	17.6525	18.2493	18.9678	19.4960	19.8014	19.9109	19.8938	19.6579	18.9597	17.9978	17.5717	(90)
Living area fraction										fLA = Living area / (4) =		0.4270	(91)
MIT	18.9568	17.9910	18.5964	19.3305	19.8813	20.2071	20.3331	20.3099	20.0439	19.3120	18.3339	17.9197	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9568	17.9910	18.5964	19.3305	19.8813	20.2071	20.3331	20.3099	20.0439	19.3120	18.3339	17.9197	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8883	0.8291	0.7683	0.6674	0.5459	0.4197	0.3102	0.3500	0.5347	0.7224	0.8327	0.8846	(94)
Useful gains	642.4454	707.8868	758.0353	770.4160	691.6551	518.3003	365.2132	375.1415	505.7573	591.3481	598.6789	609.5706	(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	1560.3799	1391.1287	1283.1199	1097.0574	859.1176	584.4134	389.0891	406.9542	621.3140	914.8427	1183.4777	1450.2343	(97)
Space heating kWh	682.9432	459.1386	390.6629	235.1818	124.5921	0.0000	0.0000	0.0000	0.0000	240.6800	421.0551	625.4538	(98a)
Space heating requirement - total per year (kWh/year)												3179.7075	
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	682.9432	459.1386	390.6629	235.1818	124.5921	0.0000	0.0000	0.0000	0.0000	240.6800	421.0551	625.4538	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3179.7075	
Space heating per m2											(98c) / (4) =	35.1543	(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 %)	305.4251	(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	682.9432	459.1386	390.6629	235.1818	124.5921	0.0000	0.0000	0.0000	0.0000	240.6800	421.0551	625.4538	(98)
Space heating efficiency (main heating system 1)	305.4251	305.4251	305.4251	305.4251	305.4251	0.0000	0.0000	0.0000	0.0000	305.4251	305.4251	305.4251	(210)
Space heating fuel (main heating system)	223.6042	150.3277	127.9079	77.0015	40.7930	0.0000	0.0000	0.0000	0.0000	78.8016	137.8587	204.7814	(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	369.9743	328.3086	350.6459	311.6603	304.6318	246.5676	243.3768	252.4997	254.7416	315.0774	331.4188	366.2835	(64)
Efficiency of water heater												299.4705	(216)
(217)m	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	299.4705	(217)
Fuel for water heating, kWh/month	123.5428	109.6297	117.0886	104.0704	101.7235	82.3345	81.2691	84.3154	85.0640	105.2115	110.6683	122.3104	(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	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	25.1422	20.1700	18.1608	13.3054	10.2775	8.3968	9.3755	12.1866	15.8291	20.7687	23.4582	25.8409	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.1179	-52.8512	-89.0492	-111.1134	-124.5078	-110.8931	-108.8179	-99.5326	-82.2257	-63.9533	-37.0358	-26.4705	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1041.0760	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	299.4705	
Water heating fuel used	1227.2282	(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)	202.9116	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-938.5683	(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	1532.6475	(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	1041.0760	0.1550	161.3788	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.2282	0.1414	173.5808	(264)
Space and water heating			334.9595	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	202.9116	0.1443	29.2864	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-938.5683	0.1330	-124.8101	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-124.8101	(269)
Total CO2, kg/year			239.4359	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.6500	(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	1041.0760	1.5738	1638.4878	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.2282	1.5230	1869.1153	(278)
Space and water heating			3507.6031	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	202.9116	1.5338	311.2326	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-938.5683	1.4914	-1399.7815	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1399.7815	(283)
Total Primary energy kWh/year			2419.0542	(286)
Dwelling Primary energy Rate (DPER)			26.7400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	90.4500	(1b)	x 2.5000	(2b) =	226.1250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.4500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		226.1250	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1327 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3827 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3253 (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	0.4147	0.4066	0.3985	0.3578	0.3497	0.3090	0.3090	0.3009	0.3253	0.3497	0.3659	0.3822	(22b)
Effective ac	0.5860	0.5827	0.5794	0.5640	0.5611	0.5477	0.5477	0.5453	0.5529	0.5611	0.5670	0.5730	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.5200	1.1450	23.4962			(27)
External Wall	92.0500	20.5200	71.5300	0.1800	12.8754			(29a)

Communal Wall	39.6500	2.1000	37.5500	0.1800	6.7590	(29a)
External Roof	90.4500		90.4500	0.1100	9.9495	(30)
Total net area of external elements Aum(A, m2)			222.1500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.1801	(33)
Party Wall			18.8500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.7700 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	13.8000	0.0500	0.6900
E3 Sill	9.6000	0.0500	0.4800
E4 Jamb	44.8000	0.0500	2.2400
E7 Party floor between dwellings (in blocks of flats)	46.0400	0.0700	3.2228
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.6400	0.0200	0.1328
E14 Flat roof	15.8600	0.0800	1.2688
E15 Flat roof with parapet	36.8200	0.5600	20.6192
E16 Corner (normal)	20.0000	0.0900	1.8000
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	7.5400	0.1200	0.9048

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 30.6084 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 85.7885 (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	43.7277	43.4786	43.2343	42.0871	41.8724	40.8732	40.8732	40.6882	41.2581	41.8724	42.3066	42.7606	(38)
Heat transfer coeff	129.5162	129.2670	129.0228	127.8756	127.6609	126.6617	126.6617	126.4767	127.0466	127.6609	128.0951	128.5491	(39)
Average = Sum(39)m / 12 =												127.8745	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4319	1.4292	1.4265	1.4138	1.4114	1.4004	1.4004	1.3983	1.4046	1.4114	1.4162	1.4212	(40)
HLP (average)												1.4138	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6318 (42)

Hot water usage for mixer showers

68.3469	67.3198	65.8231	62.9594	60.8460	58.4892	57.1497	58.6350	60.2633	62.7938	65.7190	68.0850	(42a)

Hot water usage for baths

29.5146	29.0763	28.4590	27.3209	26.4687	25.5237	25.0133	25.6262	26.2936	27.3048	28.4663	29.4148	(42b)

Hot water usage for other uses

41.5826	40.0705	38.5584	37.0463	35.5342	34.0221	34.0221	35.5342	37.0463	38.5584	40.0705	41.5826	(42c)

Average daily hot water use (litres/day) 128.1806 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.4441	136.4665	132.8405	127.3265	122.8489	118.0351	116.1850	119.7955	123.6032	128.6569	134.2558	139.0824	(44)
Energy conte	220.8453	194.3265	204.1708	174.3037	165.3782	145.1379	140.5157	148.3318	152.4151	174.5862	191.2720	217.7695	(45)
Energy content (annual)										Total = Sum(45)m =		2129.0529	
Distribution loss (46)m = 0.15 x (45)m	33.1268	29.1490	30.6256	26.1456	24.8067	21.7707	21.0774	22.2498	22.8623	26.1879	28.6908	32.6654	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	265.0955	234.2944	248.4210	217.1264	209.6284	187.9606	184.7659	192.5820	195.2379	218.8364	234.0947	262.0197	(62)
WWHRS	-31.2453	-27.6336	-28.9364	-23.9604	-22.3303	-19.1082	-17.9109	-19.0464	-19.7701	-23.3067	-26.4037	-30.6667	(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	233.8502	206.6608	219.4847	193.1660	187.2981	168.8525	166.8550	173.5356	175.4678	195.5297	207.6911	231.3529	(64)
										Total per year (kWh/year) = Sum(64)m =		2359.7443	(64)
12Total per year (kWh/year)												2360	(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	108.8312	96.5879	103.2869	92.2142	90.3884	82.5165	82.1216	84.7205	84.9362	93.4501	97.8561	107.8085	(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	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	131.5915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.9794	133.9414	120.9794	125.0120	120.9794	125.0120	120.9794	120.9794	125.0120	120.9794	125.0120	120.9794	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.9032	242.3926	236.1193	222.7642	205.9057	190.0611	179.4759	176.9865	183.2598	196.6149	213.4734	229.3180	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	36.1591	(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)	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	-105.2732	(71)
Water heating gains (Table 5)	146.2785	143.7320	138.8265	128.0752	121.4898	114.6063	110.3785	113.8716	117.9670	125.6049	135.9113	144.9039	(72)
Total internal gains	572.6385	585.5435	561.4027	541.3288	513.8523	492.1568	473.3112	474.3149	488.7162	508.6767	539.8742	560.6787	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.7500	10.6334	0.6300	0.7000	0.7700	12.1864	(74)
East	4.6500	19.6403	0.6300	0.7000	0.7700	27.9108	(76)
West	12.1200	19.6403	0.6300	0.7000	0.7700	72.7481	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	112.8453	220.1990	363.8564	536.5124	665.2427	685.0061	650.4658	553.1252	424.7346	261.3728	140.5433	92.9362	(83)
Total gains	685.4838	805.7425	925.2590	1077.8413	1179.0950	1177.1629	1123.7771	1027.4401	913.4508	770.0495	680.4175	653.6149	(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	14.3107	14.3383	14.3655	14.4943	14.5187	14.6332	14.6332	14.6547	14.5889	14.5187	14.4695	14.4184	
alpha	1.9540	1.9559	1.9577	1.9663	1.9679	1.9755	1.9755	1.9770	1.9726	1.9679	1.9646	1.9612	
util living area	0.9252	0.8980	0.8545	0.7735	0.6653	0.5356	0.4245	0.4685	0.6499	0.8206	0.9009	0.9311	(86)
MIT	17.3388	17.7452	18.4075	19.2788	20.0278	20.5632	20.8055	20.7562	20.3150	19.3204	18.1868	17.2699	(87)
Th 2	19.7390	19.7411	19.7431	19.7528	19.7546	19.7631	19.7631	19.7646	19.7598	19.7546	19.7509	19.7471	(88)
util rest of house	0.9153	0.8848	0.8352	0.7424	0.6168	0.4620	0.3252	0.3684	0.5819	0.7886	0.8858	0.9220	(89)
MIT 2	15.5795	16.0825	16.8994	17.9576	18.8342	19.4245	19.6548	19.6199	19.1846	18.0377	16.6447	15.4960	(90)
Living area fraction									fLA = Living area / (4) =			0.4270	(91)
MIT	16.3307	16.7924	17.5433	18.5217	19.3438	19.9107	20.1461	20.1051	19.6673	18.5854	17.3031	16.2534	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.3307	16.7924	17.5433	18.5217	19.3438	19.9107	20.1461	20.1051	19.6673	18.5854	17.3031	16.2534	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8765	0.8421	0.7912	0.7057	0.5988	0.4714	0.3577	0.3979	0.5762	0.7508	0.8446	0.8847	(94)
Useful gains	600.8399	678.5172	732.0515	760.6257	706.0355	554.9705	402.0261	408.8476	526.2991	578.1212	574.6772	578.2303	(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	1558.1700	1537.2966	1424.8404	1230.3858	975.8142	672.6637	449.1528	468.6080	707.3003	1019.4179	1306.9704	1549.4568	(97)
Space heating kWh	712.2536	577.0998	515.4350	338.2273	200.7153	0.0000	0.0000	0.0000	0.0000	328.3248	527.2511	722.5925	(98a)
Space heating requirement - total per year (kWh/year)												3921.8994	
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	712.2536	577.0998	515.4350	338.2273	200.7153	0.0000	0.0000	0.0000	0.0000	328.3248	527.2511	722.5925	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3921.8994	
Space heating per m2											(98c) / (4) =	43.3599	(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	712.2536	577.0998	515.4350	338.2273	200.7153	0.0000	0.0000	0.0000	0.0000	328.3248	527.2511	722.5925	(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)	771.6724	625.2436	558.4344	366.4435	217.4597	0.0000	0.0000	0.0000	0.0000	355.7148	571.2363	782.8738	(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	233.8502	206.6608	219.4847	193.1660	187.2981	168.8525	166.8550	173.5356	175.4678	195.5297	207.6911	231.3529	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3917	86.2355	85.9065	85.3028	84.2152	79.8000	79.8000	79.8000	79.8000	85.2129	86.0572	86.4358	(217)
Fuel for water heating, kWh/month	270.6859	239.6470	255.4926	226.4473	222.4041	211.5946	209.0915	217.4631	219.8845	229.4603	241.3407	267.6587	(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	25.1371	20.1659	18.1572	13.3027	10.2754	8.3951	9.3736	12.1841	15.8260	20.7645	23.4535	25.8358	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.9632	-25.5837	-39.3051	-47.3276	-53.8200	-51.2511	-50.6151	-46.3808	-39.4405	-30.5816	-19.2280	-14.4770	(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	-5.1095	-11.0643	-22.5988	-34.8617	-47.0218	-47.6006	-47.0541	-39.4228	-28.3456	-16.1310	-6.9174	-4.0182	(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	4249.0785	(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	2811.1703	(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)	202.8710	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-745.1196	(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	6604.0001	(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	4249.0785	0.2100	892.3065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2811.1703	0.2100	590.3458	(264)
Space and water heating			1482.6522	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	202.8710	0.1443	29.2805	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-434.9738	0.1332	-57.9412	
PV Unit electricity exported	-310.1459	0.1251	-38.8038	
Total			-96.7451	(269)
Total CO2, kg/year			1427.1170	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7800	(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	4249.0785	1.1300	4801.4586	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2811.1703	1.1300	3176.6225	(278)
Space and water heating			7978.0811	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	202.8710	1.5338	311.1703	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-434.9738	1.4922	-649.0805	
PV Unit electricity exported	-310.1459	0.4592	-142.4247	
Total			-791.5052	(283)
Total Primary energy kWh/year			7627.8470	(286)
Target Primary Energy Rate (TPER)			84.3300	(287)

Full SAP Calculation Printout

Property Reference	F2	**Issued on Date**	04/10/2024
Assessment Reference	F2_Copy	**Prop Type Ref**	F2
Property	F2		

SAP Rating	84 B	**DER**	2.49	**TER**	15.19
Environmental	98 A	**% DER < TER**			83.61
CO_2 Emissions (t/year)	0.17	**DFEE**	34.63	**TFEE**	45.08
Compliance Check	See BREL	**% DFEE < TFEE**			23.19
% DPER < TPER	68.94	**DPER**	25.25	**TPER**	81.29

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	79.5600 (1b)	x	2.5000 (2b)	=	198.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	198.9000	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1006	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3506	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2980	(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	0.3799	0.3725	0.3650	0.3278	0.3203	0.2831	0.2831	0.2756	0.2980	0.3203	0.3352	0.3501	(22b)
Effective ac	0.5722	0.5694	0.5666	0.5537	0.5513	0.5401	0.5401	0.5380	0.5444	0.5513	0.5562	0.5613	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			20.7500	1.1450	23.7595			(27)
External Wall	88.1900	22.8500	65.3400	0.1500	9.8010	9.0000	588.0600	(29a)
External Roof	79.5600		79.5600	0.1000	7.9560	9.0000	716.0400	(30)
Total net area of external elements Aum(A, m2)			167.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.6165			(33)
Party Wall			30.1000	0.0000	0.0000	20.0000	602.0000	(32)
Party Floor			79.5600			40.0000	3182.4000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5988.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		75.2702 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		8.3875 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.0040 (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	37.5553	37.3714	37.1911	36.3442	36.1858	35.4482	35.4482	35.3116	35.7323	36.1858	36.5063	36.8414	(38)
Heat transfer coeff													

	89.5593	89.3754	89.1951	88.3483	88.1898	87.4523	87.4523	87.3157	87.7364	88.1898	88.5104	88.8454 (39)
Average = Sum(39)m / 12 =												88.3475

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1257	1.1234	1.1211	1.1105	1.1085	1.0992	1.0992	1.0975	1.1028	1.1085	1.1125	1.1167	(40)
HLP (average)												1.1105	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4545 (42)
Hot water usage for mixer showers												
	89.8878	88.5369	86.5685	82.8022	80.0228	76.9233	75.1615	77.1150	79.2565	82.5845	86.4316	89.5434 (42a)
Hot water usage for baths												
	28.2357	27.8164	27.2259	26.1371	25.3218	24.4177	23.9294	24.5158	25.1543	26.1216	27.2329	28.1403 (42b)
Hot water usage for other uses												
	39.7661	38.3201	36.8740	35.4280	33.9820	32.5359	32.5359	33.9820	35.4280	36.8740	38.3201	39.7661 (42c)
Average daily hot water use (litres/day)												145.2035 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	157.8896	154.6734	150.6684	144.3673	139.3266	133.8769	131.6268	135.6128	139.8388	145.5801	151.9845	157.4498	(44)
Energy conte	250.0585	220.2528	231.5717	197.6316	187.5603	164.6173	159.1913	167.9170	172.4352	197.5509	216.5298	246.5283	(45)
Energy content (annual)										Total = Sum(45)m =		2411.8448	
Distribution loss (46)m = 0.15 x (45)m													
	37.5088	33.0379	34.7358	29.6447	28.1341	24.6926	23.8787	25.1875	25.8653	29.6326	32.4795	36.9792	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2200	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.7316	(55)
Total storage loss													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)
If cylinder contains dedicated solar storage													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	358.5957	318.2864	340.1089	302.6676	296.0975	239.0773	236.1333	244.8590	246.8952	306.0881	321.5658	355.0655	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	358.5957	318.2864	340.1089	302.6676	296.0975	239.0773	236.1333	244.8590	246.8952	306.0881	321.5658	355.0655	(64)
										Total per year (kWh/year) = Sum(64)m =		3565.4404	(64)
12Total per year (kWh/year)												3565	(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													
	127.0305	112.8731	120.8837	108.1829	106.2499	72.7449	71.5410	74.4423	75.3443	109.5717	114.4666	125.8567	(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	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.2175	122.0265	110.2175	113.8914	110.2175	113.8914	110.2175	110.2175	113.8914	110.2175	113.8914	110.2175	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	218.5185	220.7860	215.0719	202.9072	187.5515	173.1192	163.4776	161.2101	166.9242	179.0889	194.4446	208.8769	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	(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)													
	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	(71)
Water heating gains (Table 5)													
	170.7400	167.9659	162.4781	150.2540	142.8090	101.0345	96.1573	100.0569	104.6449	147.2738	158.9814	169.1623	(72)
Total internal gains													
	559.2928	570.5953	547.5843	526.8695	500.3948	447.8621	429.6693	431.3013	445.2774	496.3971	527.1343	548.0735	(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	
East	7.5100	19.6403	0.6300	0.7000	0.7700	45.0774	(76)
South	13.2400	46.7521	0.6300	0.7000	0.7700	189.1736	(78)

Solar gains	234.2511	397.9987	539.8743	657.8402	724.3698	713.0224	690.0181	641.7320	581.1601	438.8016	280.4415	200.5329	(83)
Total gains	793.5439	968.5940	1087.4586	1184.7098	1224.7647	1160.8844	1119.6874	1073.0334	1026.4374	935.1987	807.5758	748.6064	(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	18.5740	18.6122	18.6498	18.8286	18.8624	19.0215	19.0215	19.0512	18.9599	18.8624	18.7941	18.7232	
alpha	2.2383	2.2408	2.2433	2.2552	2.2575	2.2681	2.2681	2.2701	2.2640	2.2575	2.2529	2.2482	
util living area													
	0.8696	0.8137	0.7492	0.6565	0.5469	0.4296	0.3230	0.3481	0.5007	0.6862	0.8215	0.8818	(86)
Living	18.5502	19.0190	19.5416	20.1087	20.5397	20.8124	20.9290	20.9134	20.7192	20.1565	19.2667	18.4589	
Non living	17.7753	18.2251	18.7238	19.2590	19.6475	19.8832	19.9678	19.9599	19.8114	19.3186	18.4806	17.6923	
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	19.7468	19.0190	19.5416	20.1087	20.5397	20.8124	20.9290	20.9134	20.7192	20.1565	19.2667	18.8143	(87)
Th 2	19.9799	19.9818	19.9836	19.9923	19.9939	20.0015	20.0015	20.0029	19.9986	19.9939	19.9906	19.9872	(88)
util rest of house													
	0.8561	0.7959	0.7257	0.6249	0.5049	0.3738	0.2559	0.2802	0.4448	0.6501	0.8013	0.8693	(89)
MIT 2	18.8521	18.2251	18.7238	19.2590	19.6475	19.8832	19.9678	19.9599	19.8114	19.3186	18.4806	18.0134	(90)
Living area fraction										fLA = Living area / (4) =		0.4183	(91)
MIT	19.2264	18.5572	19.0659	19.6145	20.0207	20.2718	20.3699	20.3588	20.1911	19.6691	18.8095	18.3484	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2264	18.5572	19.0659	19.6145	20.0207	20.2718	20.3699	20.3588	20.1911	19.6691	18.8095	18.3484	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8449	0.7668	0.7021	0.6122	0.5060	0.3894	0.2812	0.3050	0.4560	0.6373	0.7736	0.8451	(94)
Useful gains	670.4447	742.7510	763.4564	725.2915	619.7636	451.9909	314.8810	327.3039	468.0834	596.0083	624.7112	632.6466	(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													
	1336.7957	1220.6166	1120.8150	946.6041	733.8011	496.0151	329.6834	345.6619	534.4144	799.8000	1036.4082	1257.0216	(97)
Space heating kWh													
	495.7652	321.1257	265.8748	159.3451	84.8439	0.0000	0.0000	0.0000	0.0000	151.6210	296.4218	464.5350	(98a)
Space heating requirement - total per year (kWh/year)												2239.5325	
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													
	495.7652	321.1257	265.8748	159.3451	84.8439	0.0000	0.0000	0.0000	0.0000	151.6210	296.4218	464.5350	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2239.5325	
Space heating per m2											(98c) / (4) =	28.1490	(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 %)	307.0079	(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													
	495.7652	321.1257	265.8748	159.3451	84.8439	0.0000	0.0000	0.0000	0.0000	151.6210	296.4218	464.5350	(98)
Space heating efficiency (main heating system 1)													
	307.0079	307.0079	307.0079	307.0079	307.0079	0.0000	0.0000	0.0000	0.0000	307.0079	307.0079	307.0079	(210)
Space heating fuel (main heating system)													
	161.4829	104.5985	86.6019	51.9026	27.6357	0.0000	0.0000	0.0000	0.0000	49.3867	96.5518	151.3104	(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													
	358.5957	318.2864	340.1089	302.6676	296.0975	239.0773	236.1333	244.8590	246.8952	306.0881	321.5658	355.0655	(64)
Efficiency of water heater												299.0365	(216)
(217)m	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	299.0365	(217)
Fuel for water heating, kWh/month													
	119.9171	106.4373	113.7349	101.2143	99.0172	79.9492	78.9647	81.8827	82.5636	102.3581	107.5340	118.7365	(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	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	23.4300	18.7964	16.9241	12.3993	9.5776	7.8250	8.7370	11.3567	14.7512	19.3543	21.8607	24.0812	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.1540	-46.3192	-78.0948	-98.0301	-110.9771	-100.3852	-98.5159	-89.8765	-73.9105	-56.2069	-32.5065	-23.2359	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	729.4706	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	299.0365	
Water heating fuel used	1192.3096	(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)	189.0932	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-836.2126	(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	1274.6607	(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	729.4706	0.1554	113.3371	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1192.3096	0.1414	168.6368	(264)
Space and water heating			281.9739	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	189.0932	0.1443	27.2920	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-836.2126	0.1328	-111.0208	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-111.0208	(269)
Total CO2, kg/year			198.2451	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4900	(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	729.4706	1.5751	1149.0253	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1192.3096	1.5230	1815.9144	(278)
Space and water heating			2964.9397	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	189.0932	1.5338	290.0375	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-836.2126	1.4906	-1246.4558	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1246.4558	(283)
Total Primary energy kWh/year			2008.5213	(286)
Dwelling Primary energy Rate (DPER)			25.2500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	79.5600	(1b) x	2.5000	(2b) =	198.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		198.9000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1508 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4008 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3407 (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	0.4344	0.4259	0.4174	0.3748	0.3663	0.3237	0.3237	0.3152	0.3407	0.3663	0.3833	0.4003	(22b)
Effective ac	0.5944	0.5907	0.5871	0.5702	0.5671	0.5524	0.5524	0.5497	0.5580	0.5671	0.5735	0.5801	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			17.7900	1.1450	20.3702			(27)
External Wall	88.1900	19.8900	68.3000	0.1800	12.2940			(29a)
External Roof	79.5600		79.5600	0.1100	8.7516			(30)
Total net area of external elements Aum(A, m2)			167.7500					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	43.5158	(33)
Party Wall	30.1000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.2702 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	12.3900	0.0500	0.6195
E3 Sill	7.0500	0.0500	0.3525
E4 Jamb	32.4000	0.0500	1.6200
E7 Party floor between dwellings (in blocks of flats)	29.8100	0.0700	2.0867
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.4600	0.0200	0.1092
E15 Flat roof with parapet	35.2700	0.5600	19.7512
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E18 Party wall between dwellings	7.5000	0.0600	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.0400	0.1200	1.4448
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500

Thermal bridges (Sum(L x Psi) calculated using Appendix K)				27.0339	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	70.5497	(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	39.0114	38.7710	38.5352	37.4281	37.2209	36.2566	36.2566	36.0781	36.6281	37.2209	37.6400	38.0781	(38)
Heat transfer coeff	109.5612	109.3207	109.0850	107.9778	107.7707	106.8064	106.8064	106.6278	107.1778	107.7707	108.1897	108.6278	(39)
Average = Sum(39)m / 12 =												107.9768	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3771	1.3741	1.3711	1.3572	1.3546	1.3425	1.3425	1.3402	1.3471	1.3546	1.3599	1.3654	(40)
HLP (average)												1.3572	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy				2.4545	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.3729	64.3905	62.9589	60.2198	58.1984	55.9442	54.6629	56.0837	57.6411	60.0614	62.8594	65.1225	(42a)

Hot water usage for baths

28.2357	27.8164	27.2259	26.1371	25.3218	24.4177	23.9294	24.5158	25.1543	26.1216	27.2329	28.1403	(42b)

Hot water usage for other uses

39.7661	38.3201	36.8740	35.4280	33.9820	32.5359	32.5359	33.9820	35.4280	36.8740	38.3201	39.7661	(42c)

Average daily hot water use (litres/day)	122.6016	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3748	130.5270	127.0588	121.7849	117.5022	112.8979	111.1283	114.5814	118.2234	123.0571	128.4123	133.0288	(44)
Energy conte	211.2330	185.8686	195.2846	166.7174	158.1805	138.8211	134.4000	141.8758	145.7812	166.9873	182.9468	208.2910	(45)
Energy content (annual)										Total = Sum(45)m =		2036.3874	
Distribution loss (46)m = 0.15 x (45)m	31.6850	27.8803	29.2927	25.0076	23.7271	20.8232	20.1600	21.2814	21.8672	25.0481	27.4420	31.2437	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	255.4832	225.8365	239.5348	209.5401	202.4307	181.6438	178.6502	186.1259	188.6040	211.2375	225.7696	252.5412	(62)
WWHRS	-29.8858	-26.4312	-27.6772	-22.9179	-21.3586	-18.2767	-17.1315	-18.2176	-18.9098	-22.2926	-25.2548	-29.3323	(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	225.5974	199.4053	211.8576	186.6223	181.0720	163.3671	161.5187	167.9083	169.6942	188.9449	200.5148	223.2089	(64)
										Total per year (kWh/year) = Sum(64)m =		2279.7115	(64)
12Total per year (kWh/year)												2280	(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	105.6351	93.7756	100.3323	89.6917	87.9952	80.4162	80.0881	82.5738	82.7305	90.9234	95.0880	104.6569	(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	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	122.7230	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.2116	122.0200	110.2116	113.8853	110.2116	113.8853	110.2116	110.2116	113.8853	110.2116	113.8853	110.2116	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	218.5185	220.7860	215.0719	202.9072	187.5515	173.1192	163.4776	161.2101	166.9242	179.0889	194.4446	208.8769	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	35.2723	(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)	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	-98.1784	(71)
Water heating gains (Table 5)	141.9827	139.5471	134.8552	124.5719	118.2731	111.6892	107.6453	110.9863	114.9034	122.2089	132.0667	140.6679	(72)
Total internal gains	533.5297	545.1700	522.9556	504.1813	478.8530	458.5106	441.1515	442.2249	455.5298	474.3263	503.2135	522.5732	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East	6.4400	19.6403	0.6300	0.7000	0.7700	38.6549	(76)
South	11.3500	46.7521	0.6300	0.7000	0.7700	162.1692	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	200.8242	341.2087	462.8472	563.9918	621.0373	611.3114	591.5875	550.1845	498.2459	376.1915	240.4240	171.9171	(83)
Total gains	734.3538	886.3787	985.8028	1068.1730	1099.8903	1069.8220	1032.7390	992.4094	953.7758	850.5178	743.6376	694.4903	(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	15.1830	15.2164	15.2493	15.4057	15.4353	15.5747	15.5747	15.6007	15.5207	15.4353	15.3755	15.3135	
alpha	2.0122	2.0144	2.0166	2.0270	2.0290	2.0383	2.0383	2.0400	2.0347	2.0290	2.0250	2.0209	
util living area	0.8981	0.8573	0.8089	0.7343	0.6383	0.5144	0.4002	0.4270	0.5824	0.7568	0.8622	0.9071	(86)
MIT	17.7760	18.2411	18.8341	19.5504	20.1656	20.6281	20.8419	20.8135	20.4871	19.6740	18.6073	17.6927	(87)
Th 2	19.7809	19.7833	19.7856	19.7963	19.7983	19.8077	19.8077	19.8095	19.8041	19.7983	19.7942	19.7900	(88)
util rest of house	0.8856	0.8405	0.7861	0.7014	0.5901	0.4437	0.3075	0.3349	0.5153	0.7196	0.8431	0.8956	(89)
MIT 2	16.1203	16.6918	17.4191	18.2877	19.0075	19.5179	19.7188	19.6986	19.3791	18.4580	17.1621	16.0203	(90)
Living area fraction									fLA = Living area / (4) =			0.4183	(91)
MIT	16.8129	17.3399	18.0110	18.8159	19.4919	19.9823	20.1886	20.1650	19.8426	18.9666	17.7667	16.7198	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8129	17.3399	18.0110	18.8159	19.4919	19.9823	20.1886	20.1650	19.8426	18.9666	17.7667	16.7198	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8440	0.7972	0.7453	0.6704	0.5765	0.4547	0.3386	0.3639	0.5176	0.6892	0.8014	0.8552	(94)
Useful gains	619.7785	706.5893	734.7479	716.1404	634.0433	486.4865	349.6664	361.1528	493.7154	586.1917	595.9453	593.8974	(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	1370.9255	1359.9347	1255.6743	1070.6970	839.7420	574.8653	383.2839	401.4515	615.4755	901.6789	1154.0221	1360.0027	(97)
Space heating kWh	558.8534	439.0482	387.5693	255.2808	153.0398	0.0000	0.0000	0.0000	0.0000	234.7225	401.8153	569.9824	(98a)
Space heating requirement - total per year (kWh/year)												3000.3116	
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	558.8534	439.0482	387.5693	255.2808	153.0398	0.0000	0.0000	0.0000	0.0000	234.7225	401.8153	569.9824	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3000.3116	
Space heating per m2											(98c) / (4) =	37.7113	(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	558.8534	439.0482	387.5693	255.2808	153.0398	0.0000	0.0000	0.0000	0.0000	234.7225	401.8153	569.9824	(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)	605.4749	475.6751	419.9017	276.5772	165.8070	0.0000	0.0000	0.0000	0.0000	254.3039	435.3362	617.5324	(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	225.5974	199.4053	211.8576	186.6223	181.0720	163.3671	161.5187	167.9083	169.6942	188.9449	200.5148	223.2089	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0103	85.7785	85.3960	84.7628	83.6850	79.8000	79.8000	79.8000	79.8000	84.5474	85.5867	86.0684	(217)
Fuel for water heating, kWh/month	262.2912	232.4654	248.0883	220.1701	216.3734	204.7207	202.4043	210.4114	212.6493	223.4780	234.2828	259.3389	(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	22.8998	18.3711	16.5411	12.1187	9.3608	7.6479	8.5393	11.0997	14.4174	18.9164	21.3660	23.5362	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.0031	-22.6728	-34.9038	-42.1194	-47.9833	-45.7303	-45.1690	-41.3519	-35.1036	-27.1456	-17.0235	-12.7996	(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	-4.4122	-9.5628	-19.5469	-30.1745	-40.7174	-41.2199	-40.7411	-34.1211	-24.5211	-13.9428	-5.9740	-3.4689	(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												3250.6085	(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	2726.6738	(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)	184.8144	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-655.4087	(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	5592.6881	(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	3250.6085	0.2100	682.6278	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2726.6738	0.2100	572.6015	(264)
Space and water heating			1255.2293	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.8144	0.1443	26.6744	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-387.0060	0.1332	-51.5344	
PV Unit electricity exported	-268.4027	0.1251	-33.5768	
Total			-85.1113	(269)
Total CO2, kg/year			1208.7217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1900	(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	3250.6085	1.1300	3673.1876	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2726.6738	1.1300	3081.1414	(278)
Space and water heating			6754.3290	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.8144	1.5338	283.4745	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-387.0060	1.4921	-577.4370	
PV Unit electricity exported	-268.4027	0.4592	-123.2396	
Total			-700.6766	(283)
Total Primary energy kWh/year			6467.2278	(286)
Target Primary Energy Rate (TPER)			81.2900	(287)

Full SAP Calculation Printout

Property Reference	F3	**Issued on Date**	04/10/2024
Assessment Reference	F3_Copy	**Prop Type Ref**	F3
Property	F3		

SAP Rating	84 B	**DER**	2.46	**TER**	14.69
Environmental	98 A	**% DER < TER**			83.25
CO_2 Emissions (t/year)	0.17	**DFEE**	33.69	**TFEE**	43.47
Compliance Check	See BREL	**% DFEE < TFEE**			22.48
% DPER < TPER	68.31	**DPER**	24.90	**TPER**	78.58

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	82.2900	(1b)	x 2.5000	(2b) =	205.7250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.2900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		205.7250	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1458 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3958 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3365 (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	0.4290	0.4206	0.4122	0.3701	0.3617	0.3196	0.3196	0.3112	0.3365	0.3617	0.3785	0.3953	(22b)
Effective ac	0.5920	0.5884	0.5849	0.5685	0.5654	0.5511	0.5511	0.5484	0.5566	0.5654	0.5716	0.5781	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	78.2400	19.0000	59.2400	0.1500	8.8860	9.0000	533.1600	(29a)
Communal Wall	19.7000	2.1000	17.6000	0.1500	2.6400	9.0000	158.4000	(29a)
External Roof	82.2900		82.2900	0.1000	8.2290	9.0000	740.6100	(30)
Total net area of external elements Aum(A, m2)			180.2300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.6107			(33)
Party Wall			27.2000	0.0000	0.0000	20.0000	544.0000	(32)
Party Floor			82.2900			40.0000	3291.6000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6167.7700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		74.9516 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		9.0115 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.6222 (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	40.1911	39.9486	39.7108	38.5941	38.3851	37.4125	37.4125	37.2324	37.7872	38.3851	38.8078	39.2497	(38)

Heat transfer coeff

	92.8134	92.5708	92.3330	91.2163	91.0074	90.0347	90.0347	89.8546	90.4094	91.0074	91.4300	91.8719 (39)
Average = Sum(39)m / 12 =												91.2153

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1279	1.1249	1.1220	1.1085	1.1059	1.0941	1.0941	1.0919	1.0987	1.1059	1.1111	1.1164	(40)
HLP (average)												1.1085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5049 (42)

Hot water usage for mixer showers

	91.0501	89.6818	87.6879	83.8730	81.0576	77.9180	76.1334	78.1122	80.2814	83.6524	87.5493	90.7013 (42a)

Hot water usage for baths

	28.5992	28.1745	27.5764	26.4736	25.6478	24.7321	24.2375	24.8315	25.4781	26.4579	27.5835	28.5026 (42b)

Hot water usage for other uses

	40.2824	38.8176	37.3528	35.8880	34.4232	32.9584	32.9584	34.4232	35.8880	37.3528	38.8176	40.2824 (42c)

Average daily hot water use (litres/day) 147.0816 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.9318	156.6740	152.6171	146.2345	141.1286	135.6085	133.3293	137.3669	141.6475	147.4631	153.9504	159.4863	(44)
Energy conte	253.2929	223.1016	234.5668	200.1878	189.9862	166.7464	161.2502	170.0889	174.6655	200.1061	219.3305	249.7170	(45)
Energy content (annual)										Total = Sum(45)m =		2443.0400	
Distribution loss (46)m = 0.15 x (45)m													
	37.9939	33.4652	35.1850	30.0282	28.4979	25.0120	24.1875	25.5133	26.1998	30.0159	32.8996	37.4575	(46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.2200 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.7316 (55)

Total storage loss

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)

If cylinder contains dedicated solar storage

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

	361.8301	321.1352	343.1040	305.2238	298.5234	241.2064	238.1922	247.0309	249.1255	308.6433	324.3665	358.2542	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	361.8301	321.1352	343.1040	305.2238	298.5234	241.2064	238.1922	247.0309	249.1255	308.6433	324.3665	358.2542	(64)
										Total per year (kWh/year) = Sum(64)m =		3596.6356	(64)
12Total per year (kWh/year)												3597	(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

	128.1060	113.8203	121.8796	109.0328	107.0565	73.4528	72.2256	75.1645	76.0859	110.4213	115.3978	126.9170	(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	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	(66)

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

	113.0629	125.1768	113.0629	116.8317	113.0629	116.8317	113.0629	113.0629	116.8317	113.0629	116.8317	113.0629	(67)

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

	224.1599	226.4860	220.6244	208.1456	192.3934	177.5886	167.6981	165.3720	171.2337	183.7124	199.4646	214.2694	(68)

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

	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	(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)

	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	(71)

Water heating gains (Table 5)

	172.1854	169.3755	163.8166	151.4345	143.8931	102.0178	97.0775	101.0275	105.6748	148.4158	160.2747	170.5873	(72)

Total internal gains

	569.9815	581.6115	558.0771	536.9850	509.9227	457.0113	438.4116	440.0356	454.3134	505.7643	537.1442	558.4928	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	814.1895	983.7551	1076.8625	1135.7334	1146.6266	1075.8528	1040.4350	1014.6630	1000.3567	941.2285	827.0016	769.2667	(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	18.4593	18.5077	18.5553	18.7825	18.8256	19.0290	19.0290	19.0671	18.9501	18.8256	18.7386	18.6485	
alpha	2.2306	2.2338	2.2370	2.2522	2.2550	2.2686	2.2686	2.2711	2.2633	2.2550	2.2492	2.2432	
util living area													
	0.8710	0.8182	0.7623	0.6826	0.5829	0.4663	0.3532	0.3742	0.5210	0.6947	0.8234	0.8825	(86)
Living	18.5243	18.9791	19.4714	20.0250	20.4711	20.7772	20.9144	20.8994	20.6942	20.1307	19.2510	18.4425	
Non living	17.7495	18.1869	18.6589	19.1872	19.5943	19.8634	19.9645	19.9568	19.7966	19.2981	18.4669	17.6770	

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	19.7335	18.9791	19.4714	20.0250	20.4711	20.7772	20.9144	20.8994	20.6942	20.1307	19.2510	18.8002	(87)
Th 2	19.9781	19.9805	19.9829	19.9939	19.9960	20.0056	20.0056	20.0074	20.0019	19.9960	19.9918	19.9874	(88)
util rest of house	0.8576	0.8006	0.7395	0.6517	0.5405	0.4081	0.2815	0.3028	0.4645	0.6589	0.8034	0.8702	(89)
MIT 2	18.8381	18.1869	18.6589	19.1872	19.5943	19.8634	19.9645	19.9568	19.7966	19.2981	18.4669	18.0002	(90)
Living area fraction									fLA = Living area / (4) =			0.3739	(91)
MIT	19.1729	18.4831	18.9628	19.5005	19.9222	20.2051	20.3197	20.3093	20.1322	19.6094	18.7601	18.2993	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1729	18.4831	18.9628	19.5005	19.9222	20.2051	20.3197	20.3093	20.1322	19.6094	18.7601	18.2993	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8456	0.7704	0.7137	0.6352	0.5372	0.4202	0.3048	0.3252	0.4723	0.6438	0.7745	0.8453	(94)
Useful gains	688.4900	757.8801	768.5191	721.4310	616.0199	452.1231	317.1101	329.9610	472.4632	605.9520	640.5305	650.2332	(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	1380.4032	1257.4023	1150.7244	966.9362	748.2775	504.6540	334.9015	351.2691	545.3719	819.9218	1066.0844	1295.3334	(97)
Space heating kWh	514.7834	335.6789	284.3607	176.7638	98.3996	0.0000	0.0000	0.0000	0.0000	159.1935	306.3988	479.9545	(98a)
Space heating requirement - total per year (kWh/year)												2355.5334	
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	514.7834	335.6789	284.3607	176.7638	98.3996	0.0000	0.0000	0.0000	0.0000	159.1935	306.3988	479.9545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2355.5334	
Space heating per m2											(98c) / (4) =	28.6248	(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 %)	306.7578	(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	514.7834	335.6789	284.3607	176.7638	98.3996	0.0000	0.0000	0.0000	0.0000	159.1935	306.3988	479.9545	(98)
Space heating efficiency (main heating system 1)	306.7578	306.7578	306.7578	306.7578	306.7578	0.0000	0.0000	0.0000	0.0000	306.7578	306.7578	306.7578	(210)
Space heating fuel (main heating system)	167.8143	109.4280	92.6988	57.6232	32.0773	0.0000	0.0000	0.0000	0.0000	51.8955	99.8830	156.4604	(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	361.8301	321.1352	343.1040	305.2238	298.5234	241.2064	238.1922	247.0309	249.1255	308.6433	324.3665	358.2542	(64)
Efficiency of water heater												299.1059	(216)
(217)m	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	299.1059	(217)
Fuel for water heating, kWh/month	120.9706	107.3651	114.7099	102.0454	99.8053	80.6425	79.6348	82.5898	83.2901	103.1886	108.4454	119.7750	(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	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	23.7460	19.0500	17.1524	12.5666	9.7068	7.9305	8.8548	11.5099	14.9502	19.6154	22.1556	24.4060	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.1072	-47.8592	-80.7025	-101.3317	-114.6217	-103.1244	-101.2001	-92.3858	-76.0631	-58.0088	-33.5822	-24.0205	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	767.8806	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	299.1059	
Water heating fuel used	1202.4624	(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)	191.6441	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-862.0073	(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	1299.9798	(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	767.8806	0.1552	119.1626	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1202.4624	0.1414	170.0743	(264)
Space and water heating			289.2369	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	191.6441	0.1443	27.6602	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-862.0073	0.1328	-114.4804	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-114.4804	(269)
Total CO2, kg/year			202.4166	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4600	(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	767.8806	1.5745	1209.0026	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1202.4624	1.5230	1831.3827	(278)
Space and water heating			3040.3853	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	191.6441	1.5338	293.9502	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-862.0073	1.4907	-1285.0372	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1285.0372	(283)
Total Primary energy kWh/year			2049.2983	(286)
Dwelling Primary energy Rate (DPER)			24.9000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	82.2900 (1b)	x	2.5000 (2b)	=	205.7250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.2900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	205.7250	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1458 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3958 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3365 (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	0.4290	0.4206	0.4122	0.3701	0.3617	0.3196	0.3196	0.3112	0.3365	0.3617	0.3785	0.3953	(22b)
Effective ac	0.5920	0.5884	0.5849	0.5685	0.5654	0.5511	0.5511	0.5484	0.5566	0.5654	0.5716	0.5781	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			18.4700	1.1450	21.1489			(27)
External Wall	78.2400	18.4700	59.7700	0.1800	10.7586			(29a)
Communal Wall	19.7000	2.1000	17.6000	0.1800	3.1680			(29a)

External Roof	82.2900	82.2900	0.1100	9.0519	(30)
Total net area of external elements Aum(A, m2)		180.2300			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	46.2274	(33)
Party Wall		27.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 74.9516 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3400	0.0500	0.5670
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	32.3700	0.0500	1.6185
E7 Party floor between dwellings (in blocks of flats)	33.7100	0.0700	2.3597
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.4600	0.0200	0.1092
E14 Flat roof	7.8800	0.0800	0.6304
E15 Flat roof with parapet	31.2900	0.5600	17.5224
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.8800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	10.8800	0.1200	1.3056

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 25.4628 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 71.6902 (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	40.1911	39.9486	39.7108	38.5941	38.3851	37.4125	37.4125	37.2324	37.7872	38.3851	38.8078	39.2497	(38)
Heat transfer coeff	111.8813	111.6387	111.4010	110.2842	110.0753	109.1027	109.1027	108.9225	109.4773	110.0753	110.4980	110.9399	(39)
Average = Sum(39)m / 12 =												110.2832	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3596	1.3566	1.3538	1.3402	1.3377	1.3258	1.3258	1.3236	1.3304	1.3377	1.3428	1.3482	(40)
HLP (average)												1.3402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5049 (42)

Hot water usage for mixer showers

66.2183	65.2231	63.7730	60.9985	58.9510	56.6676	55.3698	56.8089	58.3864	60.8381	63.6722	65.9646	(42a)

Hot water usage for baths

28.5992	28.1745	27.5764	26.4736	25.6478	24.7321	24.2375	24.8315	25.4781	26.4579	27.5835	28.5026	(42b)

Hot water usage for other uses

40.2824	38.8176	37.3528	35.8880	34.4232	32.9584	32.9584	34.4232	35.8880	37.3528	38.8176	40.2824	(42c)

Average daily hot water use (litres/day) 124.1874 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	135.1000	132.2153	128.7022	123.3601	119.0220	114.3581	112.5656	116.0635	119.7526	124.6488	130.0733	134.7496	(44)
Energy conte	213.9653	188.2728	197.8105	168.8738	160.2264	140.6166	136.1384	143.7109	147.6669	169.1473	185.3133	210.9853	(45)
Energy content (annual)										Total = Sum(45)m =		2062.7275	
Distribution loss (46)m = 0.15 x (45)m	32.0948	28.2409	29.6716	25.3311	24.0340	21.0925	20.4208	21.5566	22.1500	25.3721	27.7970	31.6478	(46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.2537 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.6770 (55)

Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	258.2155	228.2407	242.0607	211.6965	204.4766	183.4394	180.3886	187.9611	190.4897	213.3975	228.1360	255.2354	(62)
WWHRS	-30.2722	-26.7730	-28.0351	-23.2142	-21.6348	-18.5131	-17.3530	-18.4532	-19.1543	-22.5808	-25.5814	-29.7116	(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	227.9433	201.4677	214.0256	188.4823	182.8418	164.9263	163.0355	169.5078	171.3353	190.8166	202.5547	225.5238	(64)
									Total per year (kWh/year) = Sum(64)m =			2302.4608	(64)
12Total per year (kWh/year)												2302	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

106.5436	94.5750	101.1721	90.4087	88.6754	81.0132	80.6662	83.1840	83.3574	91.6416	95.8749	105.5527	(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	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	125.2438	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.0504	125.1629	113.0504	116.8187	113.0504	116.8187	113.0504	113.0504	116.8187	113.0504	116.8187	113.0504	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.1599	226.4860	220.6244	208.1456	192.3934	177.5886	167.6981	165.3720	171.2337	183.7124	199.4646	214.2694	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	35.5244	(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)	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	-100.1951	(71)
Water heating gains (Table 5)	143.2038	140.7366	135.9841	125.5677	119.1874	112.5184	108.4223	111.8065	115.7742	123.1742	133.1595	141.8720	(72)
Total internal gains	543.9873	555.9587	533.2320	514.1052	488.2044	467.4989	449.7439	450.8020	464.3998	483.5102	513.0160	532.7649	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4000	10.6334	0.6300	0.7000	0.7700	7.7993	(74)
South	16.0700	46.7521	0.6300	0.7000	0.7700	229.6088	(78)

Solar gains	237.4081	390.9449	504.3352	582.0649	618.9568	601.5893	585.2413	558.6136	530.8319	423.3367	281.7861	204.9050	(83)
Total gains	781.3953	946.9036	1037.5672	1096.1701	1107.1612	1069.0883	1034.9852	1009.4156	995.2317	906.8469	794.8021	737.6699	(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	15.3133	15.3466	15.3793	15.5350	15.5645	15.7033	15.7033	15.7292	15.6495	15.5645	15.5050	15.4432	
alpha	2.0209	2.0231	2.0253	2.0357	2.0376	2.0469	2.0469	2.0486	2.0433	2.0376	2.0337	2.0295	
util living area	0.8923	0.8488	0.8022	0.7339	0.6442	0.5228	0.4067	0.4289	0.5757	0.7451	0.8538	0.9020	(86)
MIT	17.8529	18.3269	18.8914	19.5652	20.1586	20.6207	20.8391	20.8143	20.5041	19.7288	18.6813	17.7654	(87)
Th 2	19.7944	19.7967	19.7990	19.8095	19.8115	19.8207	19.8207	19.8224	19.8171	19.8115	19.8075	19.8033	(88)
util rest of house	0.8794	0.8315	0.7792	0.7013	0.5966	0.4524	0.3140	0.3375	0.5093	0.7074	0.8341	0.8901	(89)
MIT 2	16.2203	16.8018	17.4942	18.3132	19.0102	19.5227	19.7291	19.7111	19.4053	18.5274	17.2574	16.1153	(90)
Living area fraction									fLA = Living area / (4) =			0.3739	(91)
MIT	16.8308	17.3721	18.0166	18.7813	19.4396	19.9333	20.1442	20.1236	19.8162	18.9766	17.7898	16.7323	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8308	17.3721	18.0166	18.7813	19.4396	19.9333	20.1442	20.1236	19.8162	18.9766	17.7898	16.7323	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8361	0.7869	0.7374	0.6686	0.5800	0.4596	0.3408	0.3622	0.5092	0.6764	0.7910	0.8480	(94)
Useful gains	653.3513	745.1391	765.1322	732.9135	642.1584	491.3452	352.7029	365.6333	506.7713	613.3554	628.7162	625.5648	(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	1401.9575	1392.3667	1282.9622	1089.7536	851.9394	581.8770	386.6782	405.5834	625.7914	922.0609	1181.2024	1390.3349	(97)
Space heating kWh	556.9630	434.9370	385.2656	256.9249	156.0771	0.0000	0.0000	0.0000	0.0000	229.6769	397.7901	568.9890	(98a)
Space heating requirement - total per year (kWh/year)												2986.6235	
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	556.9630	434.9370	385.2656	256.9249	156.0771	0.0000	0.0000	0.0000	0.0000	229.6769	397.7901	568.9890	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2986.6235	
Space heating per m2											(98c) / (4) =	36.2939	(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	556.9630	434.9370	385.2656	256.9249	156.0771	0.0000	0.0000	0.0000	0.0000	229.6769	397.7901	568.9890	(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)	603.4269	471.2210	417.4058	278.3585	169.0976	0.0000	0.0000	0.0000	0.0000	248.8374	430.9751	616.4561	(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	227.9433	201.4677	214.0256	188.4823	182.8418	164.9263	163.0355	169.5078	171.3353	190.8166	202.5547	225.5238	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9838	85.7388	85.3618	84.7550	83.7069	79.8000	79.8000	79.8000	79.8000	84.4765	85.5448	86.0454	(217)
Fuel for water heating, kWh/month	265.1003	234.9784	250.7276	222.3849	218.4309	206.6746	204.3052	212.4158	214.7059	225.8812	236.7819	262.0986	(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	23.4896	18.8443	16.9672	12.4309	9.6020	7.8449	8.7592	11.3856	14.7887	19.4036	21.9164	24.1425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.4974	-23.4086	-36.0188	-43.4419	-49.4683	-47.1360	-46.5557	-42.6311	-36.2046	-28.0154	-17.5800	-13.2224	(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	-4.5841	-9.9332	-20.3004	-31.3326	-42.2761	-42.7978	-42.3022	-35.4317	-25.4660	-14.4829	-6.2066	-3.6043	(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												3235.7784	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2754.4854	(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)	189.5748	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-677.8982	(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	5587.9404	(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	3235.7784	0.2100	679.5135	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2754.4854	0.2100	578.4419	(264)
Space and water heating			1257.9554	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	189.5748	0.1443	27.3615	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-399.1803	0.1332	-53.1599	
PV Unit electricity exported	-278.7179	0.1251	-34.8682	
Total			-88.0282	(269)
Total CO2, kg/year			1209.2180	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6900	(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	3235.7784	1.1300	3656.4296	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2754.4854	1.1300	3112.5685	(278)
Space and water heating			6768.9981	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	189.5748	1.5338	290.7762	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-399.1803	1.4921	-595.6181	
PV Unit electricity exported	-278.7179	0.4592	-127.9796	
Total			-723.5977	(283)
Total Primary energy kWh/year			6466.2774	(286)
Target Primary Energy Rate (TPER)			78.5800	(287)

Full SAP Calculation Printout

Property Reference	F4	**Issued on Date**	04/10/2024
Assessment Reference	F4_Copy	**Prop Type Ref**	F4
Property	F4		

SAP Rating	85 B	**DER**	2.04	**TER**	13.00
Environmental	98 A	**% DER < TER**			84.31
CO_2 Emissions (t/year)	0.18	**DFEE**	31.55	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			23.08
% DPER < TPER	70.49	**DPER**	20.46	**TPER**	69.32

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		106.0100	(1b)	x 2.5000	(2b) =	265.0250	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.0100						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		265.0250	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1132 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3632 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3087 (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	0.3936	0.3859	0.3782	0.3396	0.3319	0.2933	0.2933	0.2856	0.3087	0.3319	0.3473	0.3627	(22b)
Effective ac	0.5775	0.5745	0.5715	0.5577	0.5551	0.5430	0.5430	0.5408	0.5477	0.5551	0.5603	0.5658	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	96.1800	19.0000	77.1800	0.1500	11.5770	9.0000	694.6200	(29a)
Communal Wall	6.5700	2.1000	4.4700	0.1500	0.6705	9.0000	40.2300	(29a)
External Roof	106.0100		106.0100	0.1000	10.6010	9.0000	954.0900	(30)
Total net area of external elements Aum(A, m2)			208.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.7042			(33)
Party Wall			28.8900	0.0000	0.0000	20.0000	577.8000	(32)
Party Floor			106.0100			40.0000	4240.4000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7407.1400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		69.8721 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		10.4380 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.1422 (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	50.5042	50.2411	49.9832	48.7720	48.5454	47.4904	47.4904	47.2951	47.8968	48.5454	49.0038	49.4831	(38)

Heat transfer coeff

	107.6464	107.3833	107.1255	105.9142	105.6876	104.6327	104.6327	104.4373	105.0390	105.6876	106.1461	106.6253 (39)
Average = Sum(39)m / 12 =												105.9131

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0154	1.0130	1.0105	0.9991	0.9970	0.9870	0.9870	0.9852	0.9908	0.9970	1.0013	1.0058	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7886	(42)
Hot water usage for mixer showers													
	97.5920	96.1254	93.9882	89.8992	86.8816	83.5164	81.6036	83.7245	86.0495	89.6628	93.8396	97.2181	(42a)
Hot water usage for baths													
	30.6452	30.1901	29.5492	28.3675	27.4826	26.5014	25.9715	26.6079	27.3008	28.3507	29.5568	30.5416	(42b)
Hot water usage for other uses													
	43.1884	41.6179	40.0474	38.4769	36.9064	35.3360	35.3360	36.9064	38.4769	40.0474	41.6179	43.1884	(42c)
Average daily hot water use (litres/day)												157.6517	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	171.4256	167.9334	163.5849	156.7436	151.2706	145.3538	142.9110	147.2389	151.8273	158.0609	165.0143	170.9481	(44)
Energy conte	271.4963	239.1349	251.4238	214.5742	203.6393	178.7294	172.8385	182.3125	187.2182	214.4871	235.0932	267.6635	(45)
Energy content (annual)										Total = Sum(45)m =		2618.6109	
Distribution loss (46)m = 0.15 x (45)m													
	40.7244	35.8702	37.7136	32.1861	30.5459	26.8094	25.9258	27.3469	28.0827	32.1731	35.2640	40.1495	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2200	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.7316	(55)
Total storage loss													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)
If cylinder contains dedicated solar storage													
	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
	380.0335	337.1685	359.9610	319.6102	312.1765	253.1894	249.7805	259.2545	261.6782	323.0243	340.1292	376.2007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	380.0335	337.1685	359.9610	319.6102	312.1765	253.1894	249.7805	259.2545	261.6782	323.0243	340.1292	376.2007	(64)
									Total per year (kWh/year) = Sum(64)m =			3772.2065	(64)
12Total per year (kWh/year)												3772	(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													
	134.1586	119.1514	127.4845	113.8163	111.5962	77.4371	76.0787	79.2288	80.2597	115.2031	120.6389	132.8842	(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	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	136.9684	151.6436	136.9684	141.5340	136.9684	141.5340	136.9684	136.9684	141.5340	136.9684	141.5340	136.9684	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	265.6938	268.4509	261.5032	246.7123	228.0414	210.4935	198.7704	196.0133	202.9610	217.7519	236.4228	253.9707	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	(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)													
	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	(71)
Water heating gains (Table 5)													
	180.3207	177.3086	171.3501	158.0782	149.9948	107.5516	102.2563	106.4904	111.4718	154.8428	167.5540	178.6078	(72)
Total internal gains													
	647.8125	662.2326	634.6512	611.1540	579.8342	524.4086	502.8246	504.3016	520.7963	574.3926	610.3403	634.3764	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	892.0205	1064.3763	1153.4367	1209.9025	1216.5382	1143.2501	1104.8480	1078.9289	1066.8397	1009.8569	900.1977	845.1503	(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	19.1139	19.1607	19.2068	19.4265	19.4681	19.6644	19.6644	19.7012	19.5883	19.4681	19.3840	19.2969	
alpha	2.2743	2.2774	2.2805	2.2951	2.2979	2.3110	2.3110	2.3134	2.3059	2.2979	2.2923	2.2865	
util living area													
	0.8862	0.8400	0.7905	0.7163	0.6197	0.5008	0.3827	0.4045	0.5555	0.7257	0.8436	0.8964	(86)
Living	18.4908	18.9181	19.3983	19.9587	20.4248	20.7549	20.9051	20.8888	20.6673	20.0799	19.2049	18.4136	
Non living	17.7856	18.1997	18.6641	19.2037	19.6355	19.9301	20.0450	20.0357	19.8578	19.3286	18.4931	17.7162	

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	19.7164	18.9181	19.3983	19.9587	20.4248	20.7549	20.9051	20.8888	20.6673	20.0799	19.2049	18.7754	(87)
Th 2	20.0705	20.0726	20.0746	20.0841	20.0859	20.0942	20.0942	20.0957	20.0910	20.0859	20.0823	20.0785	(88)
util rest of house													
	0.8750	0.8252	0.7710	0.6891	0.5812	0.4460	0.3133	0.3357	0.5031	0.6942	0.8267	0.8861	(89)
MIT 2	18.9017	18.1997	18.6641	19.2037	19.6355	19.9301	20.0450	20.0357	19.8578	19.3286	18.4931	18.0466	(90)
Living area fraction										fLA = Living area / (4) =		0.3269	(91)
MIT	19.1679	18.4345	18.9041	19.4505	19.8935	20.1997	20.3261	20.3145	20.1224	19.5741	18.7258	18.2848	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1679	18.4345	18.9041	19.4505	19.8935	20.1997	20.3261	20.3145	20.1224	19.5741	18.7258	18.2848	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8626	0.7942	0.7427	0.6684	0.5725	0.4526	0.3316	0.3529	0.5050	0.6746	0.7968	0.8616	(94)
Useful gains	769.4577	845.3086	856.6485	808.6912	696.4312	517.4861	366.4053	380.8027	538.7557	681.2904	717.2642	728.2132	(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													
	1600.4814	1453.3771	1328.7923	1117.4464	865.9500	585.9092	389.8755	408.8229	632.5820	948.4551	1234.0291	1501.7982	(97)
Space heating kWh													
	618.2816	408.6221	351.2750	222.3037	126.1220	0.0000	0.0000	0.0000	0.0000	198.7706	372.0707	575.5473	(98a)
Space heating requirement - total per year (kWh/year)												2872.9929	
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													
	618.2816	408.6221	351.2750	222.3037	126.1220	0.0000	0.0000	0.0000	0.0000	198.7706	372.0707	575.5473	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2872.9929	
Space heating per m2											(98c) / (4) =	27.1011	(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 %)												305.2892	(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													
	618.2816	408.6221	351.2750	222.3037	126.1220	0.0000	0.0000	0.0000	0.0000	198.7706	372.0707	575.5473	(98)
Space heating efficiency (main heating system 1)													
	305.2892	305.2892	305.2892	305.2892	305.2892	0.0000	0.0000	0.0000	0.0000	305.2892	305.2892	305.2892	(210)
Space heating fuel (main heating system)													
	202.5232	133.8475	115.0630	72.8174	41.3123	0.0000	0.0000	0.0000	0.0000	65.1089	121.8748	188.5252	(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													
	380.0335	337.1685	359.9610	319.6102	312.1765	253.1894	249.7805	259.2545	261.6782	323.0243	340.1292	376.2007	(64)
Efficiency of water heater												299.5065	(216)
(217)m	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	299.5065	(217)
Fuel for water heating, kWh/month													
	126.8866	112.5747	120.1847	106.7123	104.2303	84.5355	83.3973	86.5606	87.3698	107.8522	113.5632	125.6069	(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	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	28.4593	22.8311	20.5569	15.0609	11.6334	9.5046	10.6124	13.7944	17.9176	23.5089	26.5532	29.2503	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-36.9457	-60.3065	-100.8235	-125.1927	-140.0031	-124.5306	-122.2055	-112.2147	-93.3195	-72.5376	-42.4573	-30.5193	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												941.0724	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												299.5065	
Water heating fuel used												1259.4741	(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)												229.6831	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1061.0559	(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												1369.1737	(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	941.0724	0.1550	145.8852	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1259.4741	0.1414	178.1461	(264)
Space and water heating			324.0313	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	229.6831	0.1443	33.1504	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1061.0559	0.1331	-141.1925	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-141.1925	(269)
Total CO2, kg/year			215.9892	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0400	(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	941.0724	1.5739	1481.1214	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1259.4741	1.5231	1918.2432	(278)
Space and water heating			3399.3646	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	229.6831	1.5338	352.2956	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1061.0559	1.4917	-1582.8115	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1582.8115	(283)
Total Primary energy kWh/year			2168.8487	(286)
Dwelling Primary energy Rate (DPER)			20.4600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	106.0100	(1b) x	2.5000	(2b) =	265.0250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	106.0100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		265.0250	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1509	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4009	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3408	(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	0.4345	0.4260	0.4175	0.3749	0.3663	0.3238	0.3238	0.3152	0.3408	0.3663	0.3834	0.4004	(22b)
Effective ac	0.5944	0.5907	0.5871	0.5703	0.5671	0.5524	0.5524	0.5497	0.5581	0.5671	0.5735	0.5802	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			19.0000	1.1450	21.7557			(27)
External Wall	96.1800	19.0000	77.1800	0.1800	13.8924			(29a)
Communal Wall	6.5700	2.1000	4.4700	0.1800	0.8046			(29a)

External Roof	106.0100	106.0100	0.1100	11.6611	(30)
Total net area of external elements Aum(A, m2)		208.7600			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		50.2138	(33)
Party Wall		28.8900	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 69.8721 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.8000	0.0500	0.8900
E3 Sill	8.8500	0.0500	0.4425
E4 Jamb	51.6700	0.0500	2.5835
E7 Party floor between dwellings (in blocks of flats)	30.1800	0.0700	2.1126
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.9200	0.0200	0.2184
E14 Flat roof	2.6300	0.0800	0.2104
E15 Flat roof with parapet	38.4700	0.5600	21.5432
E16 Corner (normal)	10.0000	0.0900	0.9000
E18 Party wall between dwellings	7.5000	0.0600	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	11.5600	0.1200	1.3872

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 30.7378 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 80.9516 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	51.9850	51.6644	51.3502	49.8742	49.5981	48.3126	48.3126	48.0745	48.8077	49.5981	50.1567	50.7408	(38)
Heat transfer coeff	132.9366	132.6161	132.3018	130.8259	130.5497	129.2642	129.2642	129.0261	129.7594	130.5497	131.1084	131.6924	(39)

Average = Sum(39)m / 12 = 130.8245

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2540	1.2510	1.2480	1.2341	1.2315	1.2194	1.2194	1.2171	1.2240	1.2315	1.2368	1.2423	(40)
HLP (average)												1.2341	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7886 (42)

Hot water usage for mixer showers

70.9760	69.9094	68.3551	65.3812	63.1866	60.7392	59.3481	60.8906	62.5815	65.2093	68.2470	70.7041	(42a)

Hot water usage for baths

30.6452	30.1901	29.5492	28.3675	27.4826	26.5014	25.9715	26.6079	27.3008	28.3507	29.5568	30.5416	(42b)

Hot water usage for other uses

43.1884	41.6179	40.0474	38.4769	36.9064	35.3360	35.3360	36.9064	38.4769	40.0474	41.6179	43.1884	(42c)

Average daily hot water use (litres/day) 133.1126 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.8096	141.7174	137.9517	132.2256	127.5757	122.5766	120.6555	124.4049	128.3592	133.6074	139.4217	144.4341	(44)
Energy conte	229.3431	201.8037	212.0266	181.0103	171.7414	150.7222	145.9223	154.0393	158.2798	181.3040	198.6318	226.1489	(45)
Energy content (annual)										Total = Sum(45)m =		2210.9733	
Distribution loss (46)m = 0.15 x (45)m	34.4015	30.2706	31.8040	27.1515	25.7612	22.6083	21.8883	23.1059	23.7420	27.1956	29.7948	33.9223	(46)

Water storage loss:

Store volume	125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.2537	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.6770	(55)

Total storage loss

20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)

If cylinder contains dedicated solar storage

20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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

273.5932	241.7716	256.2768	223.8330	215.9915	193.5449	190.1725	198.2894	201.1025	225.5542	241.4545	270.3991	(62)
WWHRS -32.4473	-28.6966	-30.0495	-24.8821	-23.1893	-19.8432	-18.5999	-19.7791	-20.5306	-24.2033	-27.4194	-31.8464	(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

241.1460	213.0749	226.2273	198.9509	192.8023	173.7017	171.5727	178.5104	180.5720	201.3509	214.0352	238.5527	(64)
									Total per year (kWh/year) = Sum(64)m =		2430.4969	(64)

12Total per year (kWh/year) 2430 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.6567	99.0740	105.8990	94.4441	92.5041	84.3733	83.9193	86.6182	86.8862	95.6837	100.3033	110.5946	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	139.4317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	136.9684	151.6436	136.9684	141.5340	136.9684	141.5340	136.9684	136.9684	141.5340	136.9684	141.5340	136.9684	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.6938	268.4509	261.5032	246.7123	228.0414	210.4935	198.7704	196.0133	202.9610	217.7519	236.4228	253.9707	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	36.9432	(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)	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	-111.5453	(71)
Water heating gains (Table 5)	150.0762	147.4316	142.3374	131.1724	124.3335	117.1852	112.7948	116.4223	120.6753	128.6072	139.3101	148.6487	(72)
Total internal gains	620.5680	635.3556	608.6384	587.2482	557.1729	534.0422	513.3631	514.2335	529.9999	551.1570	585.0964	607.4174	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)
South	16.5300	46.7521	0.6300	0.7000	0.7700	236.1813	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	244.2080	402.1436	518.7854	598.7485	636.7040	618.8415	602.0234	574.6273	546.0434	435.4642	289.8574	210.7739	(83)
Total gains	864.7760	1037.4993	1127.4239	1185.9967	1193.8768	1152.8837	1115.3865	1088.8608	1076.0432	986.6212	874.9538	818.1912	(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	15.4776	15.5150	15.5519	15.7273	15.7606	15.9173	15.9173	15.9467	15.8566	15.7606	15.6934	15.6238	
alpha	2.0318	2.0343	2.0368	2.0485	2.0507	2.0612	2.0612	2.0631	2.0571	2.0507	2.0462	2.0416	
util living area	0.9046	0.8667	0.8256	0.7628	0.6778	0.5573	0.4385	0.4611	0.6094	0.7718	0.8703	0.9131	(86)
MIT	17.7651	18.2156	18.7726	19.4613	20.0806	20.5782	20.8181	20.7910	20.4542	19.6460	18.5958	17.6869	(87)
Th 2	19.8770	19.8794	19.8818	19.8928	19.8949	19.9045	19.9045	19.9063	19.9008	19.8949	19.8907	19.8863	(88)
util rest of house	0.8937	0.8519	0.8058	0.7342	0.6347	0.4910	0.3485	0.3729	0.5479	0.7388	0.8535	0.9030	(89)
MIT 2	16.1626	16.7195	17.4083	18.2540	18.9925	19.5568	19.7926	19.7715	19.4274	18.4937	17.2074	16.0684	(90)
Living area fraction									fLA = Living area / (4) =			0.3269	(91)
MIT	16.6864	17.2085	17.8542	18.6486	19.3481	19.8907	20.1278	20.1047	19.7630	18.8704	17.6612	16.5974	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.6864	17.2085	17.8542	18.6486	19.3481	19.8907	20.1278	20.1047	19.7630	18.8704	17.6612	16.5974	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8505	0.8060	0.7610	0.6960	0.6106	0.4901	0.3679	0.3900	0.5394	0.7020	0.8089	0.8613	(94)
Useful gains	735.4695	836.2436	857.9137	825.5105	728.9702	565.0430	410.4055	424.6585	580.3754	692.5944	707.7532	704.7090	(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	1646.6052	1632.3075	1502.1833	1275.3728	998.4623	683.8923	456.0192	478.0068	734.8323	1079.6935	1384.6634	1632.6490	(97)
Space heating kWh	677.8850	534.9549	479.3365	323.9008	200.5021	0.0000	0.0000	0.0000	0.0000	288.0017	487.3753	690.3874	(98a)
Space heating requirement - total per year (kWh/year)												3682.3439	
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	677.8850	534.9549	479.3365	323.9008	200.5021	0.0000	0.0000	0.0000	0.0000	288.0017	487.3753	690.3874	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3682.3439	
Space heating per m2											(98c) / (4) =	34.7358	(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	677.8850	534.9549	479.3365	323.9008	200.5021	0.0000	0.0000	0.0000	0.0000	288.0017	487.3753	690.3874	(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)	734.4366	579.5828	519.3245	350.9218	217.2288	0.0000	0.0000	0.0000	0.0000	312.0278	528.0339	747.9820	(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	241.1460	213.0749	226.2273	198.9509	192.8023	173.7017	171.5727	178.5104	180.5720	201.3509	214.0352	238.5527	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2477	86.0360	85.7009	85.1460	84.1477	79.8000	79.8000	79.8000	79.8000	84.8619	85.8456	86.3005	(217)
Fuel for water heating, kWh/month	279.5971	247.6578	263.9731	233.6586	229.1236	217.6713	215.0033	223.6972	226.2807	237.2689	249.3257	276.4209	(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	28.4593	22.8311	20.5569	15.0609	11.6334	9.5046	10.6124	13.7944	17.9176	23.5089	26.5532	29.2503	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.7148	-29.6413	-45.3953	-54.4772	-61.7796	-58.7598	-58.0236	-53.2497	-45.4031	-35.3499	-22.3134	-16.8349	(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	-6.1551	-13.3112	-27.1578	-41.8511	-56.4100	-57.0973	-56.4476	-47.3146	-34.0441	-19.3986	-8.3297	-4.8421	(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												3989.5383	(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	2899.6782	(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)	229.6831	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-873.3017	(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	6331.5980	(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	3989.5383	0.2100	837.8030	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2899.6782	0.2100	608.9324	(264)
Space and water heating			1446.7355	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	229.6831	0.1443	33.1504	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-500.9426	0.1333	-66.7627	
PV Unit electricity exported	-372.3591	0.1251	-46.5975	
Total			-113.3601	(269)
Total CO2, kg/year			1378.4550	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0000	(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	3989.5383	1.1300	4508.1783	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2899.6782	1.1300	3276.6364	(278)
Space and water heating			7784.8147	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	229.6831	1.5338	352.2956	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-500.9426	1.4925	-747.6487	
PV Unit electricity exported	-372.3591	0.4593	-171.0307	
Total			-918.6794	(283)
Total Primary energy kWh/year			7348.5317	(286)
Target Primary Energy Rate (TPER)			69.3200	(287)

Full SAP Calculation Printout

Property Reference	F5	**Issued on Date**	04/10/2024
Assessment Reference	F5_Copy	**Prop Type Ref**	F5
Property	F5		

SAP Rating	84 B	**DER**	2.41	**TER**	14.12
Environmental	98 A	**% DER < TER**			82.93
CO_2 Emissions (t/year)	0.19	**DFEE**	35.15	**TFEE**	43.03
Compliance Check	See BREL	**% DFEE < TFEE**			18.30
% DPER < TPER	67.79	**DPER**	24.29	**TPER**	75.41

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	89.8800	(1b)	x 2.5000	(2b) =	224.7000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.8800					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		224.7000	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1335 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3835 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3260 (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	0.4156	0.4075	0.3993	0.3586	0.3504	0.3097	0.3097	0.3015	0.3260	0.3504	0.3667	0.3830	(22b)
Effective ac	0.5864	0.5830	0.5797	0.5643	0.5614	0.5480	0.5480	0.5455	0.5531	0.5614	0.5672	0.5734	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			21.2600	1.1450	24.3435			(27)
External Wall	65.6400	21.2600	44.3800	0.1500	6.6570	9.0000	399.4200	(29a)
Communal Wall	38.0600	2.1000	35.9600	0.1500	5.3940	9.0000	323.6400	(29a)
External Roof	89.8800		89.8800	0.1000	8.9880	9.0000	808.9200	(30)
Total net area of external elements Aum(A, m2)			193.5800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.4825			(33)
Party Wall			28.5400	0.0000	0.0000	20.0000	570.8000	(32)
Party Floor			89.8800			40.0000	3595.2000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6597.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.4088 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		9.6790 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.1615 (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	43.4802	43.2315	42.9878	41.8427	41.6285	40.6312	40.6312	40.4465	41.0154	41.6285	42.0619	42.5150	(38)

Heat transfer coeff

	100.6418	100.3930	100.1493	99.0042	98.7900	97.7927	97.7927	97.6081	98.1769	98.7900	99.2234	99.6765 (39)
Average = Sum(39)m / 12 =												99.0032

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1197	1.1170	1.1143	1.1015	1.0991	1.0880	1.0880	1.0860	1.0923	1.0991	1.1040	1.1090	(40)
HLP (average)												1.1015	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6241 (42)

Hot water usage for mixer showers

	93.7982	92.3886	90.3345	86.4044	83.5041	80.2697	78.4313	80.4698	82.7044	86.1772	90.1917	93.4388 (42a)

Hot water usage for baths

	29.4587	29.0212	28.4051	27.2691	26.4185	25.4754	24.9659	25.5777	26.2438	27.2530	28.4124	29.3591 (42b)

Hot water usage for other uses

	41.5031	39.9939	38.4847	36.9755	35.4663	33.9571	33.9571	35.4663	36.9755	38.4847	39.9939	41.5031 (42c)

Average daily hot water use (litres/day) 151.5218 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	164.7600	161.4037	157.2243	150.6491	145.3890	139.7022	137.3543	141.5138	145.9237	151.9149	158.5980	164.3011	(44)
Energy conte	260.9396	229.8367	241.6480	206.2311	195.7215	171.7801	166.1181	175.2236	179.9386	206.1471	225.9519	257.2558	(45)
Energy content (annual)										Total = Sum(45)m =		2516.7921	
Distribution loss (46)m = 0.15 x (45)m													
	39.1409	34.4755	36.2472	30.9347	29.3582	25.7670	24.9177	26.2835	26.9908	30.9221	33.8928	38.5884	(46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.2200 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.7316 (55)

Total storage loss

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)

If cylinder contains dedicated solar storage

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

	369.4768	327.8703	350.1852	311.2671	304.2587	246.2401	243.0601	252.1656	254.3986	314.6843	330.9879	365.7930	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	369.4768	327.8703	350.1852	311.2671	304.2587	246.2401	243.0601	252.1656	254.3986	314.6843	330.9879	365.7930	(64)
										Total per year (kWh/year) = Sum(64)m =		3670.3877	(64)
12Total per year (kWh/year)												3670	(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

	130.6485	116.0598	124.2340	111.0422	108.9635	75.1265	73.8442	76.8718	77.8392	112.4300	117.5994	129.4236	(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	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	120.4758	133.3839	120.4758	124.4917	120.4758	124.4917	120.4758	120.4758	124.4917	120.4758	124.4917	120.4758	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	238.8568	241.3354	235.0894	221.7925	205.0076	189.2321	178.6931	176.2145	182.4605	195.7574	212.5423	228.3178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	(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)													
	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	(71)
Water heating gains (Table 5)													
	175.6028	172.7080	166.9812	154.2253	146.4563	104.3423	99.2529	103.3223	108.1100	151.1156	163.3325	173.9565	(72)
Total internal gains													
	597.2966	609.7884	584.9076	562.8706	534.3008	480.4272	460.7830	462.3737	477.4232	529.7099	562.7276	585.1112	(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	
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)
Southwest	13.0100	36.7938	0.6300	0.7000	0.7700	146.2932	(79)
Northwest	4.9500	11.2829	0.6300	0.7000	0.7700	17.0687	(81)

Solar gains	210.5124	361.1556	501.9169	636.4358	727.2265	728.5795	699.6552	630.7166	548.2113	401.1587	252.5918	179.8780	(83)
Total gains	807.8089	970.9440	1086.8245	1199.3064	1261.5273	1209.0067	1160.4382	1093.0903	1025.6346	930.8686	815.3194	764.9892	(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	18.2109	18.2560	18.3004	18.5121	18.5522	18.7414	18.7414	18.7769	18.6681	18.5522	18.4712	18.3872	
alpha	2.2141	2.2171	2.2200	2.2341	2.2368	2.2494	2.2494	2.2518	2.2445	2.2368	2.2314	2.2258	
util living area													
	0.8867	0.8399	0.7821	0.6904	0.5765	0.4533	0.3447	0.3762	0.5410	0.7244	0.8452	0.8968	(86)
Living	18.3622	18.8073	19.3492	19.9805	20.4719	20.7843	20.9161	20.8952	20.6609	20.0259	19.1000	18.2842	

Non living	17.5999	18.0303	18.5517	19.1528	19.5997	19.8727	19.9700	19.9591	19.7770	19.2119	18.3306	17.5301	
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	19.6506	18.8073	19.3492	19.9805	20.4719	20.7843	20.9161	20.8952	20.6609	20.0259	19.1000	18.6641	(87)
Th 2	19.9847	19.9870	19.9892	19.9996	20.0015	20.0106	20.0106	20.0123	20.0071	20.0015	19.9976	19.9935	(88)
util rest of house	0.8747	0.8240	0.7605	0.6601	0.5346	0.3965	0.2748	0.3050	0.4844	0.6903	0.8270	0.8857	(89)
MIT 2	18.7648	18.0303	18.5517	19.1528	19.5997	19.8727	19.9700	19.9591	19.7770	19.2119	18.3306	17.8746	(90)
Living area fraction										fLA = Living area / (4) =		0.3858	(91)
MIT	19.1066	18.3301	18.8594	19.4722	19.9363	20.2244	20.3351	20.3203	20.1181	19.5260	18.6275	18.1792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1066	18.3301	18.8594	19.4722	19.9363	20.2244	20.3351	20.3203	20.1181	19.5260	18.6275	18.1792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8628	0.7928	0.7330	0.6426	0.5317	0.4092	0.2984	0.3279	0.4910	0.6721	0.7971	0.8612	(94)
Useful gains	696.9730	769.7497	796.5993	770.7204	670.7939	494.7706	346.2317	358.4573	503.6343	625.6782	649.9204	658.8281	(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	1490.1586	1348.2881	1237.7887	1046.6908	813.6595	550.0289	365.2631	382.6530	590.8343	881.8001	1143.7960	1393.4018	(97)
Space heating kWh	590.1300	388.7778	328.2449	198.6987	106.2920	0.0000	0.0000	0.0000	0.0000	190.5547	355.5905	546.5229	(98a)
Space heating requirement - total per year (kWh/year)												2704.8115	
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	590.1300	388.7778	328.2449	198.6987	106.2920	0.0000	0.0000	0.0000	0.0000	190.5547	355.5905	546.5229	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2704.8115	
Space heating per m2											(98c) / (4) =	30.0936	(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 %)												306.1532	(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	590.1300	388.7778	328.2449	198.6987	106.2920	0.0000	0.0000	0.0000	0.0000	190.5547	355.5905	546.5229	(98)
Space heating efficiency (main heating system 1)	306.1532	306.1532	306.1532	306.1532	306.1532	0.0000	0.0000	0.0000	0.0000	306.1532	306.1532	306.1532	(210)
Space heating fuel (main heating system)	192.7564	126.9880	107.2159	64.9017	34.7186	0.0000	0.0000	0.0000	0.0000	62.2416	116.1479	178.5129	(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	369.4768	327.8703	350.1852	311.2671	304.2587	246.2401	243.0601	252.1656	254.3986	314.6843	330.9879	365.7930	(64)
Efficiency of water heater												299.2742	(216)
(217)m	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	299.2742	(217)
Fuel for water heating, kWh/month	123.4576	109.5552	117.0115	104.0073	101.6655	82.2791	81.2165	84.2591	85.0052	105.1492	110.5969	122.2267	(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	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	25.0325	20.0820	18.0816	13.2474	10.2326	8.3602	9.3346	12.1334	15.7601	20.6781	23.3559	25.7282	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-31.7431	-52.1161	-87.6541	-109.4638	-123.0729	-110.3885	-108.3229	-99.0669	-81.8222	-63.0085	-36.5815	-26.1900	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												883.4829	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												299.2742	
Water heating fuel used												1226.4296	(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)												202.0266	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-929.4304	(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												1382.5087	(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	883.4829	0.1552	137.1060	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1226.4296	0.1414	173.4676	(264)
Space and water heating			310.5736	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	202.0266	0.1443	29.1587	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.4304	0.1329	-123.5329	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-123.5329	(269)
Total CO2, kg/year			216.1994	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4100	(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	883.4829	1.5745	1391.0327	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1226.4296	1.5230	1867.8981	(278)
Space and water heating			3258.9308	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	202.0266	1.5338	309.8751	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.4304	1.4911	-1385.9184	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1385.9184	(283)
Total Primary energy kWh/year			2182.8875	(286)
Dwelling Primary energy Rate (DPER)			24.2900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	89.8800	(1b)	x 2.5000	(2b) =	224.7000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.8800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		224.7000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1335	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3835	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3260	(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	0.4156	0.4075	0.3993	0.3586	0.3504	0.3097	0.3097	0.3015	0.3260	0.3504	0.3667	0.3830	(22b)
Effective ac	0.5864	0.5830	0.5797	0.5643	0.5614	0.5480	0.5480	0.5455	0.5531	0.5614	0.5672	0.5734	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.3700	1.1450	23.3244			(27)
External Wall	65.6400	20.3700	45.2700	0.1800	8.1486			(29a)

Communal Wall	38.0600	2.1000	35.9600	0.1800	6.4728	(29a)
External Roof	89.8800		89.8800	0.1100	9.8868	(30)
Total net area of external elements Aum(A, m2)			193.5800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.9326	(33)
Party Wall			28.5400	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.4088 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	12.8500	0.0500	0.6425
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	35.6500	0.0500	1.7825
E7 Party floor between dwellings (in blocks of flats)	34.7700	0.0700	2.4339
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7000	0.0200	0.1340
E14 Flat roof	15.2200	0.0800	1.2176
E15 Flat roof with parapet	26.2400	0.5600	14.6944
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4200	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	11.4200	0.1200	1.3704
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.8003 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 73.7329 (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	43.4802	43.2315	42.9878	41.8427	41.6285	40.6312	40.6312	40.4465	41.0154	41.6285	42.0619	42.5150	(38)
Heat transfer coeff	117.2132	116.9645	116.7207	115.5757	115.3614	114.3642	114.3642	114.1795	114.7483	115.3614	115.7948	116.2479	(39)
Average = Sum(39)m / 12 =												115.5746	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3041	1.3013	1.2986	1.2859	1.2835	1.2724	1.2724	1.2704	1.2767	1.2835	1.2883	1.2934	(40)
HLP (average)												1.2859	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6241 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.2169	67.1917	65.6978	62.8396	60.7303	58.3780	57.0409	58.5235	60.1487	62.6743	65.5939	67.9555	(42a)
Hot water usage for baths	29.4587	29.0212	28.4051	27.2691	26.4185	25.4754	24.9659	25.5777	26.2438	27.2530	28.4124	29.3591	(42b)
Hot water usage for other uses	41.5031	39.9939	38.4847	36.9755	35.4663	33.9571	33.9571	35.4663	36.9755	38.4847	39.9939	41.5031	(42c)
Average daily hot water use (litres/day)												127.9366	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.1787	136.2068	132.5877	127.0842	122.6151	117.8104	115.9639	119.5675	123.3680	128.4121	134.0003	138.8177	(44)
Energy conte	220.4251	193.9567	203.7823	173.9720	165.0635	144.8617	140.2483	148.0495	152.1251	174.2540	190.9080	217.3550	(45)
Energy content (annual)										Total = Sum(45)m =		2125.0011	
Distribution loss (46)m = 0.15 x (45)m	33.0638	29.0935	30.5673	26.0958	24.7595	21.7293	21.0372	22.2074	22.8188	26.1381	28.6362	32.6033	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	264.6752	233.9246	248.0325	216.7947	209.3137	187.6844	184.4985	192.2997	194.9478	218.5041	233.7307	261.6052	(62)
WWHRS	-31.1859	-27.5811	-28.8813	-23.9149	-22.2878	-19.0718	-17.8768	-19.0102	-19.7324	-23.2624	-26.3534	-30.6084	(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	233.4893	206.3435	219.1512	192.8799	187.0259	168.6126	166.6217	173.2895	175.2154	195.2418	207.3773	230.9968	(64)
										Total per year (kWh/year) = Sum(64)m =		2356.2449	(64)
12Total per year (kWh/year)												2356	(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	108.6915	96.4649	103.1578	92.1039	90.2838	82.4247	82.0327	84.6266	84.8398	93.3396	97.7351	107.6707	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	131.2037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.4521	133.3577	120.4521	124.4672	120.4521	124.4672	120.4521	120.4521	124.4672	120.4521	124.4672	120.4521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.8568	241.3354	235.0894	221.7925	205.0076	189.2321	178.6931	176.2145	182.4605	195.7574	212.5423	228.3178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	36.1204	(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)	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	-104.9630	(71)
Water heating gains (Table 5)	146.0907	143.5490	138.6529	127.9221	121.3491	114.4788	110.2590	113.7454	117.8330	125.4564	135.7432	144.7187	(72)
Total internal gains	570.7607	583.6032	559.5556	539.5429	512.1700	490.5392	471.7654	472.7732	487.1218	507.0270	538.1138	558.8497	(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	
South	3.1600	46.7521	0.6300	0.7000	0.7700	45.1502	(78)
Southwest	12.4700	36.7938	0.6300	0.7000	0.7700	140.2211	(79)
Northwest	4.7400	11.2829	0.6300	0.7000	0.7700	16.3445	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	201.7158	346.0625	480.9363	609.8232	696.8087	698.1011	670.3885	604.3398	525.2927	384.3926	242.0366	172.3617	(83)
Total gains	772.4765	929.6658	1040.4919	1149.3660	1208.9787	1188.6403	1142.1538	1077.1130	1012.4145	891.4196	780.1504	731.2114	(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	15.6362	15.6695	15.7022	15.8578	15.8872	16.0258	16.0258	16.0517	15.9721	15.8872	15.8278	15.7661	
alpha	2.0424	2.0446	2.0468	2.0572	2.0591	2.0684	2.0684	2.0701	2.0648	2.0591	2.0552	2.0511	
util living area	0.9037	0.8646	0.8159	0.7362	0.6322	0.5037	0.3914	0.4241	0.5882	0.7665	0.8694	0.9122	(86)
MIT	17.8021	18.2564	18.8534	19.5875	20.2101	20.6574	20.8555	20.8240	20.4962	19.6778	18.6205	17.7209	(87)
Th 2	19.8376	19.8398	19.8419	19.8519	19.8538	19.8625	19.8625	19.8641	19.8591	19.8538	19.8500	19.8460	(88)
util rest of house	0.8922	0.8491	0.7945	0.7048	0.5859	0.4365	0.3042	0.3366	0.5240	0.7315	0.8518	0.9016	(89)
MIT 2	16.1793	16.7401	17.4751	18.3673	19.0962	19.5906	19.7784	19.7560	19.4327	18.4992	17.2081	16.0813	(90)
Living area fraction									fLA = Living area / (4) =			0.3858	(91)
MIT	16.8055	17.3252	18.0069	18.8381	19.5260	20.0022	20.1940	20.1681	19.8431	18.9539	17.7531	16.7139	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8055	17.3252	18.0069	18.8381	19.5260	20.0022	20.1940	20.1681	19.8431	18.9539	17.7531	16.7139	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8509	0.8056	0.7528	0.6727	0.5713	0.4453	0.3308	0.3613	0.5230	0.6990	0.8097	0.8617	(94)
Useful gains	657.3165	748.9239	783.3243	773.1549	690.6734	529.2833	377.8074	389.1237	529.4647	623.0762	631.7079	630.1028	(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	1465.8042	1453.3026	1343.0933	1148.6073	902.8134	617.8192	411.0250	430.2364	659.0076	963.7223	1233.5745	1454.7149	(97)
Space heating kWh	601.5149	473.3424	416.4681	270.3257	157.8321	0.0000	0.0000	0.0000	0.0000	253.4407	433.3439	613.5114	(98a)
Space heating requirement - total per year (kWh/year)												3219.7793	
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	601.5149	473.3424	416.4681	270.3257	157.8321	0.0000	0.0000	0.0000	0.0000	253.4407	433.3439	613.5114	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3219.7793	
Space heating per m2										(98c) / (4) =		35.8231	(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	601.5149	473.3424	416.4681	270.3257	157.8321	0.0000	0.0000	0.0000	0.0000	253.4407	433.3439	613.5114	(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)	651.6954	512.8304	451.2114	292.8773	170.9991	0.0000	0.0000	0.0000	0.0000	274.5836	469.4951	664.6927	(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	233.4893	206.3435	219.1512	192.8799	187.0259	168.6126	166.6217	173.2895	175.2154	195.2418	207.3773	230.9968	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0851	85.8602	85.4762	84.8168	83.6816	79.8000	79.8000	79.8000	79.8000	84.6459	85.6727	86.1426	(217)
Fuel for water heating, kWh/month	271.2307	240.3250	256.3885	227.4077	223.4969	211.2940	208.7991	217.1548	219.5681	230.6572	242.0577	268.1564	(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	25.0276	20.0780	18.0781	13.2448	10.2306	8.3585	9.3327	12.1310	15.7570	20.6740	23.3513	25.7232	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.8614	-25.4329	-39.0778	-47.0595	-53.5203	-50.9679	-50.3358	-46.1225	-39.2171	-30.4040	-19.1137	-14.3898	(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	-5.0722	-10.9841	-22.4359	-34.6119	-46.6861	-47.2609	-46.7180	-39.1404	-28.1417	-16.0142	-6.8670	-3.9889	(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	3488.3850	(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	2816.5360	(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)	201.9869	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-740.4240	(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	5852.4838	(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	3488.3850	0.2100	732.5608	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2816.5360	0.2100	591.4726	(264)
Space and water heating			1324.0334	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	201.9869	0.1443	29.1529	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.5028	0.1332	-57.6111	
PV Unit electricity exported	-307.9213	0.1251	-38.5252	
Total			-96.1362	(269)
Total CO2, kg/year			1268.9794	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1200	(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	3488.3850	1.1300	3941.8750	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2816.5360	1.1300	3182.6857	(278)
Space and water heating			7124.5607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	201.9869	1.5338	309.8142	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.5028	1.4922	-645.3893	
PV Unit electricity exported	-307.9213	0.4592	-141.4020	
Total			-786.7913	(283)
Total Primary energy kWh/year			6777.6844	(286)
Target Primary Energy Rate (TPER)			75.4100	(287)

Full SAP Calculation Printout

Property Reference	F6	**Issued on Date**	04/10/2024
Assessment Reference	F6_Copy	**Prop Type Ref**	F6
Property	F6		

SAP Rating	83 B	**DER**	2.53	**TER**	15.04
Environmental	98 A	**% DER < TER**			83.18
CO_2 Emissions (t/year)	0.21	**DFEE**	38.82	**TFEE**	48.70
Compliance Check	See BREL	**% DFEE < TFEE**			20.30
% DPER < TPER	68.18	**DPER**	25.56	**TPER**	80.33

Assessor Details	Mr. Matthew Stainrod	**Assessor ID**	AU83-0001
Client			

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		95.3800 (1b)	x	2.5000 (2b)	=	238.4500	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3800						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	238.4500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1258 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3758 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20)	=	0.3194 (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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3194	0.3434	0.3594	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			2.1000	1.0000	2.1000			(26)
Glazing (Uw = 1.20)			22.8600	1.1450	26.1756			(27)
External Wall	97.4200	24.9600	72.4600	0.1500	10.8690	9.0000	652.1400	(29a)
Communal Wall	18.9000		18.9000	0.1500	2.8350	9.0000	170.1000	(29a)
External Roof	95.3500		95.3500	0.1000	9.5350	9.0000	858.1500	(30)
Total net area of external elements Aum(A, m2)			211.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.5146			(33)
Party Wall			16.1500	0.0000	0.0000	20.0000	323.0000	(32)
Party Floor			95.3500			40.0000	3814.0000	(32d)
Internal Wall			100.0000			9.0000	900.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6717.3900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.4277 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		10.5835 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	62.0981 (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	45.8708	45.6173	45.3689	44.2021	43.9838	42.9676	42.9676	42.7794	43.3590	43.9838	44.4255	44.8872	(38)

Heat transfer coeff

	107.9688	107.7154	107.4670	106.3002	106.0819	105.0657	105.0657	104.8775	105.4571	106.0819	106.5235	106.9852 (39)
Average = Sum(39)m / 12 =												106.2992

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1320	1.1293	1.1267	1.1145	1.1122	1.1015	1.1015	1.0996	1.1057	1.1122	1.1168	1.1217	(40)
HLP (average)												1.1145	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6924 (42)

Hot water usage for mixer showers

	95.3744	93.9411	91.8525	87.8564	84.9074	81.6186	79.7493	81.8221	84.0942	87.6253	91.7073	95.0090 (42a)

Hot water usage for baths

	29.9517	29.5068	28.8804	27.7255	26.8606	25.9017	25.3837	26.0057	26.6830	27.7091	28.8879	29.8504 (42b)

Hot water usage for other uses

	42.2033	40.6687	39.1340	37.5993	36.0647	34.5300	34.5300	36.0647	37.5993	39.1340	40.6687	42.2033 (42c)

Average daily hot water use (litres/day) 154.0686 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	167.5294	164.1166	159.8670	153.1812	147.8326	142.0503	139.6629	143.8924	148.3765	154.4684	161.2638	167.0627	(44)
Energy conte	265.3256	233.6999	245.7096	209.6974	199.0111	174.6674	168.9102	178.1689	182.9631	209.6122	229.7499	261.5799	(45)
Energy content (annual)										Total = Sum(45)m =		2559.0950	
Distribution loss (46)m = 0.15 x (45)m													
	39.7988	35.0550	36.8564	31.4546	29.8517	26.2001	25.3365	26.7253	27.4445	31.4418	34.4625	39.2370	(46)

Water storage loss:

Store volume 125.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.2200 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.7316 (55)

Total storage loss

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(56)

If cylinder contains dedicated solar storage

	53.6796	48.4848	53.6796	51.9480	53.6796	51.9480	53.6796	53.6796	51.9480	53.6796	51.9480	53.6796	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

	373.8628	331.7335	354.2468	314.7334	307.5483	249.1274	245.8522	255.1109	257.4231	318.1494	334.7859	370.1171	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	373.8628	331.7335	354.2468	314.7334	307.5483	249.1274	245.8522	255.1109	257.4231	318.1494	334.7859	370.1171	(64)
										Total per year (kWh/year) = Sum(64)m =		3712.6906	(64)
12Total per year (kWh/year)												3713	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	132.1069	117.3443	125.5845	112.1948	110.0573	76.0865	74.7726	77.8511	78.8448	113.5821	118.8622	130.8614	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	125.4080	138.8445	125.4080	129.5882	125.4080	129.5882	125.4080	125.4080	129.5882	125.4080	129.5882	125.4080	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	248.6353	251.2154	244.7137	230.8724	213.4003	196.9790	186.0086	183.4285	189.9302	203.7714	221.2435	237.6649	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	(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)													
	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	(71)
Water heating gains (Table 5)													
	177.5630	174.6194	168.7964	155.8261	147.9265	105.6757	100.5008	104.6385	109.5067	152.6642	165.0864	175.8890	(72)
Total internal gains													
	614.9929	628.0660	602.3047	579.6734	550.1214	495.6296	475.3040	476.8617	492.4117	545.2302	579.3049	602.3484	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.1000	11.2829	0.6300	0.7000	0.7700	21.0341	(75)
Southeast	3.3800	36.7938	0.6300	0.7000	0.7700	38.0070	(77)
Northwest	13.3800	11.2829	0.6300	0.7000	0.7700	46.1371	(81)

Solar gains	105.1782	201.4689	334.9221	514.3194	666.7486	701.8089	660.0217	540.2054	396.0851	238.6450	130.0424	87.3815	(83)
Total gains	720.1711	829.5349	937.2268	1093.9928	1216.8700	1197.4385	1135.3256	1017.0670	888.4968	783.8752	709.3472	689.7299	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.2822	17.3229	17.3629	17.5535	17.5896	17.7598	17.7598	17.7916	17.6938	17.5896	17.5167	17.4411	
alpha	2.1521	2.1549	2.1575	2.1702	2.1726	2.1840	2.1840	2.1861	2.1796	2.1726	2.1678	2.1627	
util living area													
	0.9118	0.8820	0.8335	0.7380	0.6106	0.4785	0.3712	0.4205	0.6149	0.7918	0.8830	0.9184	(86)
Living	17.9957	18.3698	18.9590	19.7357	20.3565	20.7360	20.8915	20.8545	20.5194	19.7248	18.7466	17.9366	

Non living	17.2422	17.6081	18.1815	18.9268	19.4959	19.8287	19.9462	19.9256	19.6614	18.9373	17.9908	17.1896	
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	19.4631	18.3698	18.9590	19.7357	20.3565	20.7360	20.8915	20.8545	20.5194	19.7248	18.7466	18.3651	(87)
Th 2	19.9748	19.9770	19.9791	19.9890	19.9909	19.9996	19.9996	20.0012	19.9962	19.9909	19.9871	19.9832	(88)
util rest of house	0.9020	0.8693	0.8153	0.7097	0.5689	0.4200	0.2969	0.3434	0.5576	0.7623	0.8682	0.9093	(89)
MIT 2	18.5769	17.6081	18.1815	18.9268	19.4959	19.8287	19.9462	19.9256	19.6614	18.9373	17.9908	17.5804	(90)
Living area fraction										fLA = Living area / (4) =		0.3710	(91)
MIT	18.9057	17.8907	18.4700	19.2269	19.8152	20.1653	20.2970	20.2703	19.9797	19.2295	18.2712	17.8715	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9057	17.8907	18.4700	19.2269	19.8152	20.1653	20.2970	20.2703	19.9797	19.2295	18.2712	17.8715	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8901	0.8366	0.7831	0.6857	0.5610	0.4302	0.3198	0.3651	0.5566	0.7361	0.8367	0.8854	(94)
Useful gains	641.0507	694.0278	733.9861	750.1941	682.7188	515.0906	363.0370	371.3069	494.5345	577.0078	593.5124	610.6781	(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	1576.9640	1399.3037	1286.3814	1097.7529	860.8776	584.7256	388.4257	405.9050	620.0602	915.4292	1189.9990	1462.6524	(97)
Space heating kWh	696.3195	473.9454	410.9821	250.2423	132.5501	0.0000	0.0000	0.0000	0.0000	251.7855	429.4704	633.8689	(98a)
Space heating requirement - total per year (kWh/year)												3279.1642	
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	696.3195	473.9454	410.9821	250.2423	132.5501	0.0000	0.0000	0.0000	0.0000	251.7855	429.4704	633.8689	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3279.1642	
Space heating per m2											(98c) / (4) =	34.3800	(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 %)												305.2188	(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	696.3195	473.9454	410.9821	250.2423	132.5501	0.0000	0.0000	0.0000	0.0000	251.7855	429.4704	633.8689	(98)
Space heating efficiency (main heating system 1)	305.2188	305.2188	305.2188	305.2188	305.2188	0.0000	0.0000	0.0000	0.0000	305.2188	305.2188	305.2188	(210)
Space heating fuel (main heating system)	228.1378	155.2805	134.6516	81.9878	43.4279	0.0000	0.0000	0.0000	0.0000	82.4934	140.7090	207.6769	(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	373.8628	331.7335	354.2468	314.7334	307.5483	249.1274	245.8522	255.1109	257.4231	318.1494	334.7859	370.1171	(64)
Efficiency of water heater												299.5251	(216)
(217)m	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	299.5251	(217)
Fuel for water heating, kWh/month	124.8185	110.7531	118.2695	105.0775	102.6786	83.1741	82.0807	85.1718	85.9437	106.2179	111.7722	123.5679	(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	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	26.0573	20.9041	18.8219	13.7897	10.6516	8.7024	9.7167	12.6301	16.4053	21.5247	24.3120	26.7815	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.7336	-55.4492	-93.3584	-116.2803	-129.9183	-115.3605	-113.2007	-103.6650	-85.8160	-67.0292	-38.8663	-27.8036	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1074.3650	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	299.5251	
Water heating fuel used	1239.5255	(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)	210.2973	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-980.4811	(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	1543.7067	(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	1074.3650	0.1549	166.4073	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1239.5255	0.1414	175.3218	(264)
Space and water heating			341.7291	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	210.2973	0.1443	30.3524	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-980.4811	0.1330	-130.4369	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-130.4369	(269)
Total CO2, kg/year			241.6446	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5300	(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	1074.3650	1.5734	1690.3995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1239.5255	1.5230	1887.8508	(278)
Space and water heating			3578.2502	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	210.2973	1.5338	322.5610	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-980.4811	1.4916	-1462.4913	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1462.4913	(283)
Total Primary energy kWh/year			2438.3200	(286)
Dwelling Primary energy Rate (DPER)			25.6400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	95.3800	(1b)	x 2.5000	(2b) =	238.4500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		238.4500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1258 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3758 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3194 (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	0.4073	0.3993	0.3913	0.3514	0.3434	0.3035	0.3035	0.2955	0.3194	0.3434	0.3594	0.3753	(22b)
Effective ac	0.5829	0.5797	0.5766	0.5617	0.5590	0.5460	0.5460	0.5437	0.5510	0.5590	0.5646	0.5704	(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			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			21.7500	1.1450	24.9046			(27)
External Wall	97.4200	23.8500	73.5700	0.1800	13.2426			(29a)

Communal Wall	18.9000	18.9000	0.1800	3.4020	(29a)
External Roof	95.3500	95.3500	0.1100	10.4885	(30)
Total net area of external elements Aum(A, m2)		211.6700			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		54.1377	(33)
Party Wall		16.1500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.4277 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	13.7700	0.0500	0.6885
E3 Sill	8.7500	0.0500	0.4375
E4 Jamb	42.2300	0.0500	2.1115
E7 Party floor between dwellings (in blocks of flats)	37.4000	0.0700	2.6180
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	9.1200	0.0200	0.1824
E14 Flat roof	7.5600	0.0800	0.6048
E15 Flat roof with parapet	38.9600	0.5600	21.8176
E16 Corner (normal)	17.5000	0.0900	1.5750
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.4600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.4600	0.1200	0.7752
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 30.4355 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 84.5732 (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	45.8708	45.6173	45.3689	44.2021	43.9838	42.9676	42.9676	42.7794	43.3590	43.9838	44.4255	44.8872	(38)
Heat transfer coeff	130.4440	130.1905	129.9421	128.7753	128.5570	127.5408	127.5408	127.3526	127.9322	128.5570	128.9986	129.4603	(39)

Average = Sum(39)m / 12 = 128.7743

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3676	1.3650	1.3624	1.3501	1.3478	1.3372	1.3372	1.3352	1.3413	1.3478	1.3525	1.3573	(40)
HLP (average)												1.3501	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6924 (42)

Hot water usage for mixer showers

69.3632	68.3208	66.8018	63.8956	61.7508	59.3590	57.9995	59.5069	61.1594	63.7275	66.6962	69.0975	(42a)

Hot water usage for baths

29.9517	29.5068	28.8804	27.7255	26.8606	25.9017	25.3837	26.0057	26.6830	27.7091	28.8879	29.8504	(42b)

Hot water usage for other uses

42.2033	40.6687	39.1340	37.5993	36.0647	34.5300	34.5300	36.0647	37.5993	39.1340	40.6687	42.2033	(42c)

Average daily hot water use (litres/day) 130.0871 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	141.5182	138.4963	134.8163	129.2203	124.6761	119.7906	117.9131	121.5773	125.4417	130.5706	136.2527	141.1512	(44)
Energy conte	224.1302	197.2169	207.2076	176.8962	167.8380	147.2966	142.6057	150.5381	154.6822	177.1831	194.1170	221.0086	(45)
Energy content (annual)										Total = Sum(45)m =		2160.7202	
Distribution loss (46)m = 0.15 x (45)m	33.6195	29.5825	31.0811	26.5344	25.1757	22.0945	21.3909	22.5807	23.2023	26.5775	29.1175	33.1513	(46)
Water storage loss:													
Store volume												125.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2537	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6770	(55)
Total storage loss	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(56)
If cylinder contains dedicated solar storage	20.9878	18.9567	20.9878	20.3107	20.9878	20.3107	20.9878	20.9878	20.3107	20.9878	20.3107	20.9878	(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	268.3804	237.1848	251.4578	219.7189	212.0881	190.1193	186.8559	194.7883	197.5049	221.4332	236.9397	265.2588	(62)
WWHRS	-31.7100	-28.0446	-29.3666	-24.3167	-22.6623	-19.3923	-18.1772	-19.3296	-20.0640	-23.6533	-26.7963	-31.1227	(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	236.6705	209.1403	222.0911	195.4022	189.4258	170.7270	168.6787	175.4586	177.4409	197.7800	210.1434	234.1361	(64)
									Total per year (kWh/year) = Sum(64)m =			2387.0946	(64)
12Total per year (kWh/year)												2387	(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	109.9234	97.5489	104.2967	93.0762	91.2063	83.2343	82.8165	85.4541	85.6900	94.3135	98.8021	108.8855	(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	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	134.6222	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.3824	138.8162	125.3824	129.5618	125.3824	129.5618	125.3824	125.3824	129.5618	125.3824	129.5618	125.3824	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	248.6353	251.2154	244.7137	230.8724	213.4003	196.9790	186.0086	183.4285	189.9302	203.7714	221.2435	237.6649	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	36.4622	(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)	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	-107.6978	(71)
Water heating gains (Table 5)	147.7466	145.1621	140.1837	129.2725	122.5891	115.6032	111.3126	114.8576	119.0139	126.7655	137.2251	146.3515	(72)
Total internal gains	588.1509	601.5804	576.6665	556.0934	527.7585	505.5307	486.0902	487.0552	501.8926	522.3060	554.4172	575.7854	(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	5.8000	11.2829	0.6300	0.7000	0.7700	19.9996	(75)
Southeast	3.2200	36.7938	0.6300	0.7000	0.7700	36.2078	(77)
Northwest	12.7300	11.2829	0.6300	0.7000	0.7700	43.8958	(81)

Solar gains	100.1032	191.7363	318.7153	489.3941	634.4085	667.7577	628.0021	514.0149	376.9060	227.1092	123.7656	83.1666 (83)
Total gains	688.2542	793.3167	895.3818	1045.4875	1162.1670	1173.2884	1114.0923	1001.0701	878.7986	749.4151	678.1828	658.9520 (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	14.3045	14.3324	14.3598	14.4899	14.5145	14.6302	14.6302	14.6518	14.5854	14.5145	14.4648	14.4132	
alpha	1.9536	1.9555	1.9573	1.9660	1.9676	1.9753	1.9753	1.9768	1.9724	1.9676	1.9643	1.9609	
util living area	0.9255	0.9015	0.8624	0.7836	0.6724	0.5391	0.4296	0.4796	0.6650	0.8285	0.9024	0.9309	(86)
MIT	17.3339	17.7121	18.3497	19.2300	20.0070	20.5576	20.8011	20.7453	20.2829	19.2832	18.1737	17.2707	(87)
Th 2	19.7882	19.7903	19.7923	19.8018	19.8035	19.8118	19.8118	19.8134	19.8086	19.8035	19.8000	19.7962	(88)
util rest of house	0.9161	0.8891	0.8446	0.7546	0.6262	0.4685	0.3337	0.3827	0.6007	0.7989	0.8882	0.9222	(89)
MIT 2	15.6045	16.0736	16.8626	17.9360	18.8498	19.4609	19.6964	19.6558	19.1919	18.0282	16.6601	15.5277	(90)
Living area fraction									fLA = Living area / (4) =			0.3710	(91)
MIT	16.2462	16.6816	17.4144	18.4161	19.2792	19.8678	20.1063	20.0600	19.5967	18.4939	17.2217	16.1744	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.2462	16.6816	17.4144	18.4161	19.2792	19.8678	20.1063	20.0600	19.5967	18.4939	17.2217	16.1744	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8758	0.8449	0.7984	0.7139	0.6032	0.4721	0.3590	0.4044	0.5876	0.7572	0.8451	0.8833	(94)
Useful gains	602.7478	670.2809	714.8809	746.4007	701.0703	553.9598	399.9571	404.8499	516.3555	567.4901	573.0995	582.0630	(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	1558.3102	1533.8524	1418.2345	1225.4388	974.3564	671.8592	447.1936	466.1117	703.2080	1014.8112	1305.6855	1550.2121	(97)
Space heating kWh	710.9385	580.3201	523.2951	344.9074	203.3249	0.0000	0.0000	0.0000	0.0000	332.8069	527.4619	720.3029	(98a)
Space heating requirement - total per year (kWh/year)												3943.3576	
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	710.9385	580.3201	523.2951	344.9074	203.3249	0.0000	0.0000	0.0000	0.0000	332.8069	527.4619	720.3029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3943.3576	
Space heating per m2											(98c) / (4) =	41.3437	(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	710.9385	580.3201	523.2951	344.9074	203.3249	0.0000	0.0000	0.0000	0.0000	332.8069	527.4619	720.3029	(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)	770.2475	628.7325	566.9502	373.6808	220.2870	0.0000	0.0000	0.0000	0.0000	360.5708	571.4647	780.3932	(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	236.6705	209.1403	222.0911	195.4022	189.4258	170.7270	168.6787	175.4586	177.4409	197.7800	210.1434	234.1361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3672	86.2238	85.9130	85.3200	84.2189	79.8000	79.8000	79.8000	79.8000	85.2174	86.0355	86.4093	(217)
Fuel for water heating, kWh/month	274.0281	242.5551	258.5070	229.0227	224.9208	213.9436	211.3768	219.8730	222.3570	232.0886	244.2519	270.9616	(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	26.0520	20.8999	18.8180	13.7869	10.6494	8.7006	9.7147	12.6276	16.4020	21.5203	24.3071	26.7761	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.8403	-26.8803	-41.2566	-49.6260	-56.3857	-53.6742	-53.0053	-48.5926	-41.3550	-32.1073	-20.2124	-15.2281	(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	-5.4356	-11.7652	-24.0213	-37.0431	-49.9526	-50.5655	-49.9875	-41.8877	-30.1257	-17.1513	-7.3581	-4.2752	(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	4272.3267	(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	2843.8863	(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)	210.2545	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-785.7326	(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	6626.7349	(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	4272.3267	0.2100	897.1886	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2843.8863	0.2100	597.2161	(264)
Space and water heating			1494.4047	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	210.2545	0.1443	30.3462	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.1638	0.1332	-60.7735	
PV Unit electricity exported	-329.5688	0.1251	-41.2368	
Total			-102.0103	(269)
Total CO2, kg/year			1434.6699	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0400	(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	4272.3267	1.1300	4827.7292	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2843.8863	1.1300	3213.5915	(278)
Space and water heating			8041.3207	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	210.2545	1.5338	322.4953	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.1638	1.4923	-680.7370	
PV Unit electricity exported	-329.5688	0.4593	-151.3547	
Total			-832.0916	(283)
Total Primary energy kWh/year			7661.8252	(286)
Target Primary Energy Rate (TPER)			80.3300	(287)